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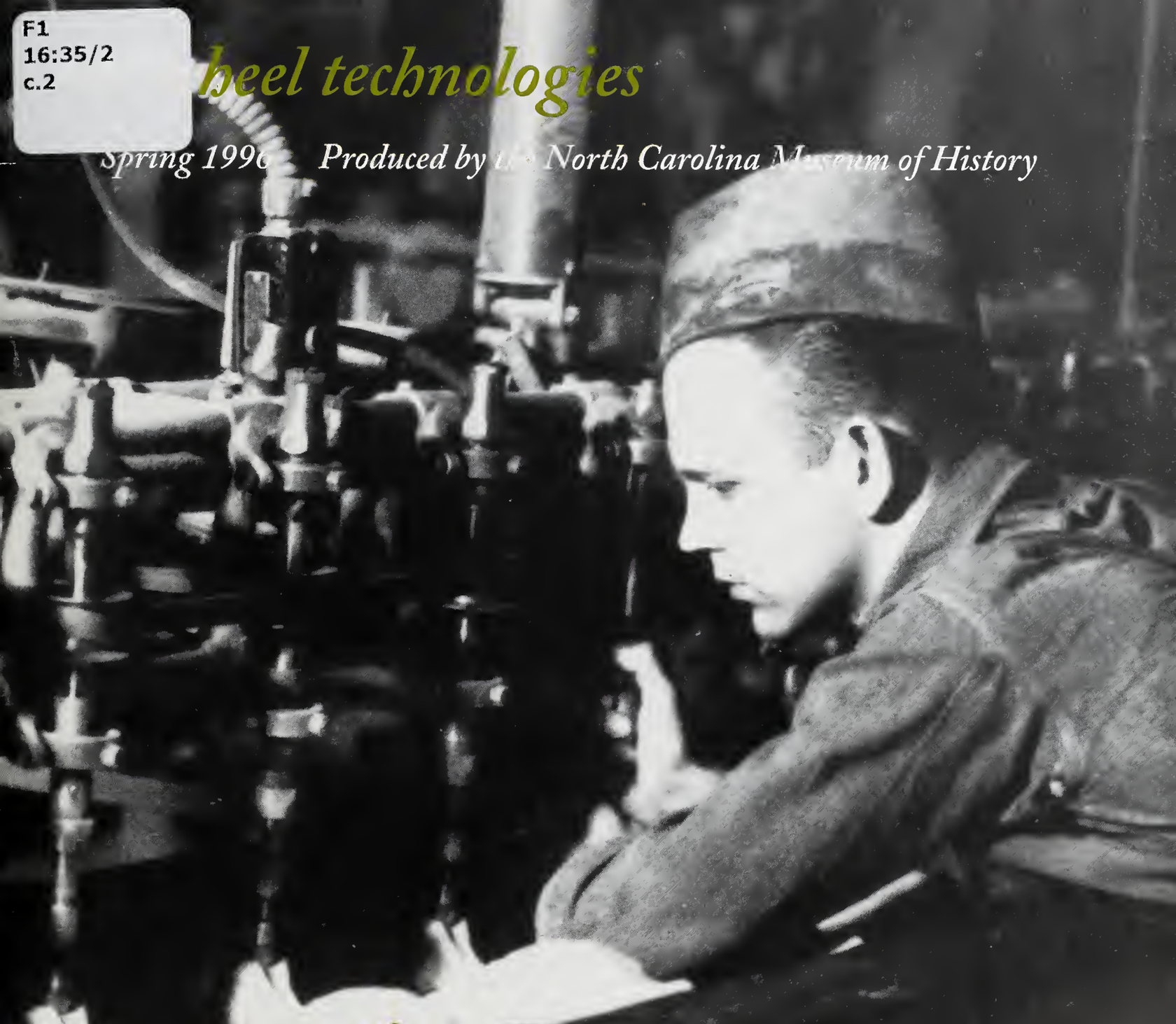
Spring 1996 *Produced by the North Carolina Museum of History*



Tar Heel

JUNIOR HISTORIAN

North Carolina History for Students

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Tar Heel Junior Historian
North Carolina History for Students

Spring 1996 Volume 35, Number 2

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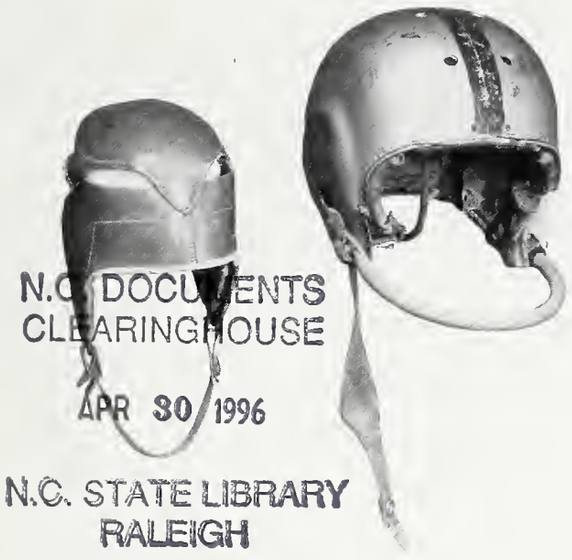

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Technology affects parts of our lives we may not even think about. Look at these football helmets. The helmet on the left was worn by Fred Eugene Crawford in 1929. The helmet on the right was worn by John Haywood Baker almost thirty years later. Compare their construction and safety features. Compare Baker's helmet with those in use today. Think of other places these technologies can be used: racing helmets, construction helmets, bicycle helmets, even surfboards. Clearly, technology has had a great impact on all of our lives, and therefore on all of our history. It has also been of great importance to North Carolina's past. These reasons are why we are exploring a few technologies in this issue.

Technology and your world

by Robert E. Ireland

The word *technology* is a very popular word. It is used everywhere . . . on television, on radio, in movies, and in print. It often takes different forms, such as *technological,* or *hi-tech.* Frequently it is used to describe ideas that are scientific, or objects that are produced using scientific research and study, or machines that require advanced skills or training to use.

Technology has been around since the Greeks came up with the term "technologia" 3,500 years ago. At that time the word meant the method, or art, of making things such as weapons, houses, and ships. But over the years the definition changed to include a focus upon a scientific method of doing things. Today, technology continues to involve the use of scientific information to improve life.

All of us have experienced the effects and results of technology. Stop for a moment and think about them.

You are experiencing them now, as you read this page. This magazine was printed with a high-speed press on specially treated paper using environmentally safe soy inks. It was designed using electronic word processing software and a computerized page layout program. Someone had to invent or develop each part of the process—machine technology, computer technology, and papermaking technology. All require technological knowledge and training to achieve.

Look around you. Think about how the heating and cooling systems in your school operate. How is the electricity that lights the room generated? Consider the chair that you are sitting in. Is it made out of wood? If not, it probably was created from petrochemicals—it may have originally come from the earth as oil!

In this issue of *Tar Heel Junior Historian* we will explore three major areas where technology has affected our lives here in North Carolina.

Industry

The first is the development of industry, which has produced thousands of jobs and a large portion of Tar Heel income. As you will see, we have many kinds of industry, some that rely on improving technology and some that seem opposed to it.

Transportation

The second area where technology has most

North Carolina industry:

A chronology of invention and technology

1777
North Carolina's first paper mill is built in Hillsborough to relieve a paper shortage during the American Revolution.

1791
President George Washington visits the Moravian village of Salem. He is impressed by the town's artisans and marvels over its water system.

1795
High Shoals Iron Works (in present-day Gaston County) becomes one of the first producers of pig iron using a charcoal process.

About 1813
Michael Schenck builds the state's first cotton mill near Lincolnton in Lincoln County. Though the mill is destroyed by a Catawba River flood only three years later, Schenck soon builds an expanded mill nearby with the assistance of Absalom Warlick.

The Roost

GOLDIE! MY MOM HAS BEEN TELLING ME STORIES ABOUT HER CHILDHOOD!
HMMMM.
DID YOU KNOW SHE ACTUALLY HAD TO CHANGE TV STATIONS BY TURNING A KNOB?
WHAT! NO REMOTE CONTROL?!
SHE USED TO WARM HER FOOD IN A GAS OVEN!
NO MICROWAVE?!!
SHE WROTE WITH A PENCIL AND PAPER!
NO COMPUTER ??!!!
SHE PLAYED CARD GAMES AND PINBALL!
NO NINTENDO ???!!!!
SHE EVEN WATCHED THE ORIGINAL "STAR TREK" TV SERIES WHEN IT FIRST CAME OUT!
NO "STAR TREK: THE NEXT GENERATION" ???!!!
IT SURE SOUNDS LIKE A PRIMITIVE TIME TO LIVE.
PRIMITIVE! IT SOUNDS LIKE SHE COULD HAVE BEEN ONE OF THE FLINTSTONES!
JERRY BROWN

As you read about the advances and technologies discussed in this issue of THJH, *think about what might have caused the improvements and how the ideas may have evolved. Think about the effects new inventions and technologies have had on everyday life in the past—both expected changes and unanticipated surprises, both good and bad. And imagine how technology might change even more in your lifetime and what impacts those changes might have on your future.*

Part of studying technology and innovation is studying how those changes affected the lives of people. Look at this photograph and try to pick out the technologies around this early family. You may laugh and think, "Technology, back then?" But look again. What about the wheels on the cart? Wheels were one of the earliest technologies of humankind. Even the use of animal power is an advance in technology. How would the cart have been moved before the family had an ox? Would they have even had a cart? See how the window coverings open and close? Hinges were an advance in fasteners. How do you think the cloth for the family's clothing was made? Could that process have been affected by technology? What other advances can you find? What advances can you think of that would change their lives even more?

1814
John Lineback of Salem patents the first cottonseed hulling machine.

1828
Henry Humphries of Greensboro opens North Carolina's first steam-powered cotton mill. His associates will later move the operation and use waterpower, though, because it will operate at a lower cost.

1830
North Carolina's craftsman-based furniture industry begins a slow change with the introduction of precarved wooden parts, precut glass and metal trimmings, and preformed metal mountings. New Bern cabinetmaker John W. Nelson has imported some of these pieces from New York.

Early 1830s
Christopher Bechtler of Rutherfordton invents several contraptions for washing gold and separating it from gravel, sand, and other ore. During the same period, several residents of the Piedmont try creating machines for washing laundry.

1837
Tired of shipping North Carolina–grown cotton to New England and then shipping finished yarn and cloth back to North Carolina (the practice of the day), Edwin Michael Holt imports the necessary machinery from the North to build a cotton mill in

significantly influenced our history is transportation. Not only has technology altered our lives by reducing the time it takes us to get from one place to another, it has also changed the ways we can get there: first, changes to road surfaces themselves and improvements in horse-drawn wagons, then the introduction of the railroad, then the automobile, and finally aircraft.

Communication

The third area of technological development we explore in this issue is communication. Until the end of the last century (1870–1900), most people still communicated only by direct, face-to-face speech or in writing. Then, with stunning speed, a whole series of communication devices were invented and put into use. The impact of technology on communications has been felt throughout the history of North Carolina.

Technology and your future

Inventions and changes in these three areas of technology will continue to affect us today and in the future. And in some cases, the debate between gains in technology and the problems technology creates will go on.

Decide for yourself. Have the advances of technology in North Carolina always

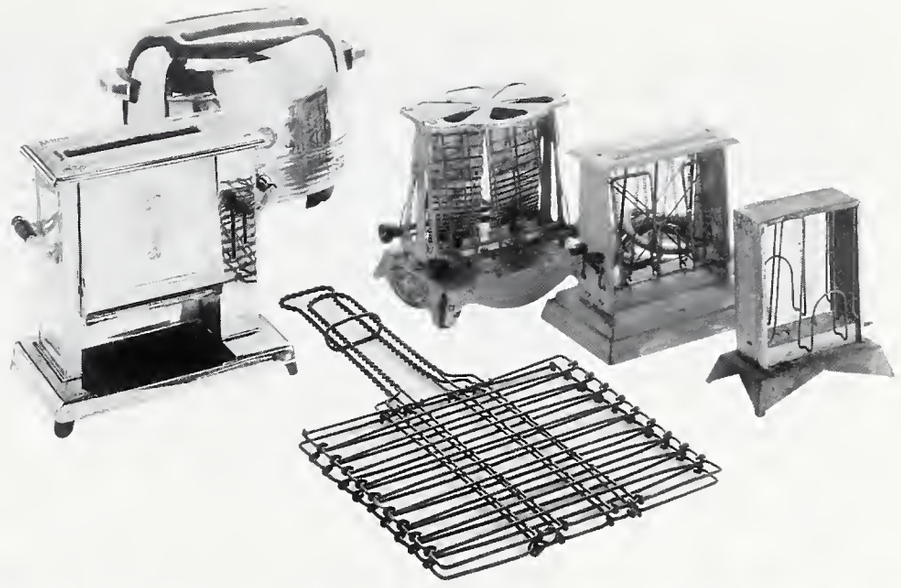
The ages of technology

Many scientists and some historians feel that studying the technological growth of mankind is more important than studying wars and conflicts between nations or the conquests of civilizations. They feel that we should study technologies surrounding the growth of power and advancements in building, hunting and farming, and manufacturing. They divide history into roughly eight overlapping time periods:

- prehistory, when people survived with few tools or weapons and no fire
- the era of nomadic hunters and gatherers, when people used tools and weapons made from wood, bone, or stone and before farming became general practice
- the metal ages, when people began using metals like wrought iron and steel, and in some locations even pottery
- the first machine, or mill, age, when power sources like water and wind began replacing human power and when simple machines began affecting everyday life
- the age of factory production, when organizations with "bosses" and workers began replacing home-based craft production, when quantity became as important as or more important than quality
- the era of steam, when steam was becoming the primary power source for industry and transportation and when mass production and interchangeable parts came into use
- the era of the internal combustion engine
- the present age of electricity and electronics

Can you see advantages and disadvantages to studying history by focusing on technology? Which way do *you* think better tells the story of human change and development? Why do you think so?

Before the age of electricity, many inventions and new technologies were assisting with housework. For example, this rocker washing machine (below) from about 1905 may not compare to the automatic clothes washers of today, but at the time it saved women hours of hard and heavy labor on laundry day. These toasters (right, above) are excellent examples of a changing technology. Which one do you think is oldest? Can you see improvements in each newer model? Can you identify the two different types of energy that did the toasting? Toasters and washing machines aside, many technologies have side effects that are not anticipated. For example, this landscape (right, below) outside Asheville affected the area in many ways during construction of Interstate 240. As you read through this issue, think about how changing technologies might affect people's lives.



outweighed any negative effects? Does the field of technology hold a future for you as a scientist or engineer? What advances do you think the next fifty years of technology will bring?

Acknowledgments and Thanks

Compiling this issue of *THJH* was a labor of many, many persons. My thanks, first of all, to Bob Ireland who proposed that we try a new approach in this issue—shortening individual articles to allow more contributions from more authors to cover more of a variety of subjects. Not always a reality-based or quick-thinking person, I *thought* the suggestion was a good one. You will read the results in these pages. Among those other laborers that I took advantage of to produce this issue were the following individuals and team members who, fortunately for us, assist with all THJHA publications: Jerry Cashion and Wilson Angley, Research Branch, Division of Archives and History, who continuously humor me with their objective interpretations of my oversimplified history; members of the Curation Branch, Museum of History, for their assistance and suggestions, Eric N. Blevins, D. Kent Thompson, and Jim Mercer, Photography Unit, Design Branch, Museum of History, for providing professionalism, patience, and last-minute speed at filling my art needs; Kay Wyche and Laura B. Baum, Editorial Unit, Education and Interpretation Branch, Museum of History, who find time to provide reviews and offer advice; Darryl Ketcham and Obelia J. Exum, Graphic Design Unit, Design Branch, Museum of History, for their assistance and advice, as well as Jennifer Blackman, Graphic Design Unit, who made computer files of the new THJHA logo, for use in this publication; members of the Education and Interpretation Branch, Museum of History, for offering suggestions and (especially during the past couple of months) helping cover some of the duties I have had to slack off on to finish this issue; and Steve Massengill and Earl Ijames, Iconographic Unit, Archives and Records Section, Division of Archives and History, for sharing their knowledge. Other persons who assisted with this Tar Heel Technologies issue include the following: the authors and contributors from across the state who provided timely and knowledgeable information as I needed it; Bill Arnold, North Carolina Film Office, North Carolina Department of Commerce; Jerry Carroll, Forsyth County Public Library, Winston-Salem; Catawba County Historical Association, Newton; Stephen Catlett, Greensboro Historical Museum, Greensboro; the Children's Services staff at Cameron Village Branch of the Wake County Public Library, Raleigh; Mike Clark at MCNC in Research Triangle Park who came through with artwork at the *very* last minute; Brenda Dalrymple and Kent Swaim, Carolco Studios, Wilmington; Davidson County Historical Museum, Lexington; Steve Dixon and Holly MacKenzie, *Asheville Citizen Times;* Rick Faust, Raleigh; Renee Gannon, managing editor, *Rice Journal;* Gaston County Museum of Art and History, Dallas; Marsha Haithcock, Randolph County Public Library, Asheboro; Betty Harris who contacted many of the county historical societies and museums in the state requesting chronology information; Ellen Holding, Rail Division, North Carolina Department of Transportation; Bill Russ, Travel and Tourism Division, North Carolina Department of Commerce; Amy Ruth, *The Goldfinch: Iowa History for Young People,* State Historical Society of Iowa, Iowa City; the Special Collections staff, D. Hiden Ramsey Library, University of North Carolina at Asheville; and Dorothy Strickland and Terri Leith, who collaborated on an article that was bumped from this issue to the Health and Healing (working title) issue that will be published in spring 1997. I also continue to thank the Tar Heel Junior Historian Association advisers and other readers who offer comments about the continuing redesign and reformat of the magazine.

Robert E. Ireland also wrote the article that begins on page 16. His biography appears there.

The cartoon is used with the permission of the Goldfinch, *published by the State Historical Society of Iowa. Photographs of the early Tar Heel family and the rocker washing machine are from the North Carolina Division of Archives and History. Other artwork is from the North Carolina Museum of History.*

Alamance County. It employs North Carolina workers, who spin cotton and weave cloth in the state. His mill will grow and encourage other entrepreneurs to open similar operations, eventually making the textile industry one of North Carolina's largest employers.

1839
A slave named Stephen living on the Caswell County farm of Abisha Slade accidentally discovers a process for curing bright-leaf tobacco. The so-called Slade formula, or Slade method, uses charcoal to raise curing barn temperatures quickly after partial curing has already taken place.

1853
Edwin M. Holt's cotton mill in Alamance County begins dyeing yarn in an eighty-gallon copper boiler (formerly used to scald hogs) and a large cast-iron washpot. This factory-dyed thread will be woven into cloth that will become legendary as "Alamance Plaids," the first dyed cotton cloth produced in the South.

1855
The Egypt Coal Mine near Sanford is first operated.

November 28, 1859
An entry in Melinda Ray's diary notes that gas streetlights are lighting Fayetteville for the first time.

1862
A native of Murfreesboro, North Carolina, Richard Jordan Gatling patents the first rapid-fire machine gun. Early Gatling guns can fire two hundred rounds per minute. Though troops use some of these guns during the Civil War (1861–1865), the United States government will not officially adopt the weapon until 1866.

Definitions

To diversify something is to give it variety.

Products made from pine trees, such as pitch, rosin, tar, and turpentine, that are used for building ships or making them seaworthy are known as naval stores.

When an object is tangible, it can be touched, or felt by touch.

The second wave of industrial growth began when manufacturing-based industries started to employ more people and earn more money than the first wave, agriculture-based industries like farming and naval stores. North Carolina's first major manufacturing industry was textiles. Old Salem, in Winston-Salem, is just one of many places where reenactors continue to demonstrate the early days of this industry.

What it was, what it is: Industry and technology

by Alex Frew McMillan

When we hear people talk about industry, most of us think of big machines, workers in overalls, buildings with smokestacks, and miles of assembly lines. But the dictionary also defines industry as "any large-scale business activity." In other words, industry is a type of work, such as farming, trading, or manufacturing. A place of industry is a place where you or I might get a job. Industry does not have to happen in a large factory—it can be based in an office, a store, even a home or a field outside.

Agriculture-based Industry

Of course, the first industries in what was to become North Carolina were outdoor industries. The first explorers to this area discovered vast forests that furnished products for Europe's building and **naval stores** industries. Native Americans and later European and African American settlers raised crops and animals, first for themselves and later for trade.

Their slow agricultural lifestyle was affected in the 1790s when Eli Whitney's cotton gin introduced technology that led to North Carolina's first major manufacturing industry—textiles.

Manufacturing-based Industry

Cotton mills became important to North Carolinians as soon as the state's first mill was built in Lincoln County about 1813. First, they provided an alternative to working on farms. But more importantly, as more and larger mills opened over the years, fewer farmers in the state had to sell their agricultural products away to the North, where cloth was made. Now farmers could raise a crop and sell it to another North Carolinian, who could weave cloth to sell to another North Carolinian, who could sew it into a final product to sell to another North Carolinian. As a result, the state's textile industry rebounded surprisingly quickly from America's Civil War (1861–1865).

By the beginning of this century, North Carolina was experiencing a true industrial boom. In addition to the established textile industry, a growing tobacco industry and an emerging furniture industry were industrializing the state.

When the Great Depression (1929–1941) hit the United States, many Tar Heel farmers left the countryside and moved to towns in search of work. This potential workforce of available and cheap laborers began attracting more industries from other states to North

Carolina. By 1940 only one in three North Carolinians was still working on a farm.

During World War II (1941–1945) North Carolina manufactured ships for the United States Navy and the merchant marine. The state's industries also manufactured uniforms, tents, and blankets for all the armed forces, boards for military buildings, and parts for radios, radars, and airplanes. The mining industry reopened old mines.

By the end of the war, North Carolina had become a manufacturing-based state. The "big three"—tobacco, textiles, and furniture—had been joined by products from a host of other industries. But a whole new type of industry was evolving, and it entered North Carolina in a big way.

Service-based industry

Service industries do not always make **tangible** products but provide services directly to customers.

North Carolina's service industries have quickly spread from the Coastal Plain to the Mountains. For example, Charlotte and Winston-Salem have become important hubs for banking, Charlotte and Greensboro for transportation, Chapel Hill for higher education, Wilmington and Asheville for films, Burlington and Smithfield for retail and wholesale trade, Raleigh for government services, and the Mountains and the Outer Banks in general for tourism. The area between Raleigh, Durham, and Chapel Hill has become known as Research Triangle Park, a place where companies conduct high-tech research-and-development programs that continue to advance technology even further.

The growth of service industries is sometimes called the "third wave" of growth because it follows the first wave of agriculture-based industries and the second wave of manufacturing-based industries.

Just as the beginning of the manufacturing era was called the Industrial Revolution, the beginning of the service era is sometimes referred to as the "information revolution," since moving information, through media and education, is the most important component of many service industries.

Service jobs are now more common than manufacturing jobs in North Carolina. As this state moves into the 2000s, its ideal economy will be a blend of all three types of industry rather than a concentration of one or another.

Research Triangle Park leads the way in the third wave

During the past twenty years or so, advances in technology have occurred at an ever increasing rate. Organizations at Research Triangle Park (RTP) in the Piedmont are good examples of business and institutional involvement in the new wave—research-and-development activities.

More than seventy companies and nonprofit institutes now employ roughly 34,000 people throughout the park. Its 6,800 acres of land sit inside a triangle formed by three educational institutions: North Carolina State University in Raleigh, Duke University in Durham, and the University of North Carolina at Chapel Hill.

Research is conducted inside modern, office-style buildings. Many are situated among trees and landscaped lots with winding driveways that are not visible from roadways to help maintain a parklike feeling and provide "the park," as it is called locally, with its nickname.

The idea for RTP arose in 1955 when Governor Luther Hodges appointed the Governor's Research Triangle Committee. By 1964, RTP was home to about 900 employees in four small research organizations: Chemstrand Research Center, the United States Forestry Service Research Center, the Research Triangle Institute, and a laboratory for the American Association of Textile Chemists and Colorists.

In April 1965, RTP became famous when IBM announced its intention to build at RTP. In the next twenty years, IBM became the park's largest employer, with almost 12,000 workers.

When the park began, its goals were many. But primarily, the committee wanted to help area colleges and universities attract and keep faculty members who specialized in science and engineering by promoting the area for technological research rather than manufacturing. It also wished to **diversify** the state's agricultural and industrial economy away from tobacco, textiles, and furniture by attracting research laboratories and high-tech industry.

Today, the park contains industrial research laboratories and trade associations, federal and state government research laboratories, nonprofit research institutes, and university-related research activities. Most researchers focus on advancing the environmental sciences, pharmaceuticals, agriculture, microelectronics, and computer technology. Some of the most important efforts currently taking place in the park are investigations into a cure for AIDS.

1867
Following the Civil War, Quakers from Baltimore, Maryland, and central North Carolina establish a model farm south of High Point. The farm promotes modern agricultural practices like scientific fertilization and crop rotation, modern machinery like reapers and cultivators, and thoroughbred livestock.

1869
Harriet Morrison Irwin becomes the first woman granted a United States patent for an architectural innovation. Unfortunately, Irwin's hexagonal house plans are not really popular at a time when elegantly decorated Victorian squares are the style of the day. She will die in 1897 and be buried under a hexagonal headstone that she designed.

1875
Richard Joshua Reynolds opens a factory for making chewing tobacco in Winston, Forsyth County.

1877
North Carolina's Department of Agriculture is established.

1878
James Lytch patents his famous cotton planter. He also invents other farm implements at his home near Gibson, Scotland County.

1881
William E. and David A. White establish a small furniture factory in Mebane. This step in industrialization begins a transition from the handcraftsmanship of small cabinetmakers to the mass production of mechanized factories.

1882
North Carolina's first registered Guernsey cattle arrive at H. T. Bahnson's farm near Winston-Salem.

Alex Frew McMillan is an assistant editor at Business North Carolina *magazine.*

The photograph in this article is provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce.

About 1884
The Pharr Yarns mill in McAdenville installs a direct-current generator to power electric lights inside the mill. These lights allow twenty-four-hour operation of a mill for the first time (the former kerosene lamps were not bright enough to permit work into the night). Thomas Edison helps install this system, perhaps in an effort to stay ahead of George Westinghouse, who is trying to prove that his alternating-current system will be better as a future distribution system. McAdenville is also the first town in North Carolina to have electric streetlights, courtesy of the generator at Pharr Yarns.

1884
W. Duke, Sons and Company in Durham installs a "Bonsack machine" to roll cigarettes. The hand-fed machine can roll 120,000 cigarettes in a day. Expert hand rollers of the time can turn out only 15,000—in a sixty-hour week.

1884
Lewis H. Latimer, an African American who invented the carbon arc light and helped improve Thomas Edison's incandescent lamp, is hired to illustrate and assist with the legal defense of Edison's patents. As a result, Latimer will serve from 1889 until his retirement in 1911 as a chief patent illustrator and defense witness for resolving patent disputes between General Electric and its rivals.

1887
The General Assembly establishes the North

During the steam age, power was distributed from its source through a system of shafts, gears, pulleys, and leather belts to a machine that used it. The wheel on top of this steam engine is turned directly by the power the engine creates. The belt on the wheel carries the engine's power into the shed, where it is used to run one machine. Another belt could be added to another wheel on the other end to distribute the power to another location or another machine.

Does power lead to the creation of new inventions and technologies?

You surely have heard the old question "Which came first—the chicken or the egg?" But stop and think about power and technology and which came first. In other words, did our great-grandparents have electricity and then invent the radio to use it, or did they invent the radio and then need electricity to power it?

Really, muscles came before either one!

If you answered by wondering, "Who cares?" you are partly correct, because at one time in history, nobody did care. Just a few hundred years ago, the only power source was human power: our arms and legs and how we threw our weight around with them.

In fact, early Native American residents of our area had relied on human power for hundreds of years. And as far as can be determined, they were able to make the clothing and other goods they needed for survival, to talk to people they needed to communicate with, and to travel to destinations they needed to reach. These Native Americans did not seem to need any more technologies.

Human muscle was just not enough

The first European settlers to North America, however, brought with them a familiarity with the power technologies they had used in Europe: animal power, wind power, and waterpower. They already knew that an animal pulling a plow could turn more earth than any farmer with a hoe, that wind blowing in sails would move a ship faster than any number of sailors rowing, and that water falling into cups on a wheel could be used to grind grain faster than any **mortar** and **pestle**.

The most common source of power in the New World quickly became waterpower.

Waterwheels powered gristmills, sawmills, and soon even small numbers of looms. Then steam power was introduced. As inventors and manufacturers refined steam engines during the first half of the 1800s, people around the world thought the ultimate power source had been created, that they had all the power they would ever need or could ever use. They "knew" steam would be able to power any new technology that could ever be imagined.

The ultimate power source?

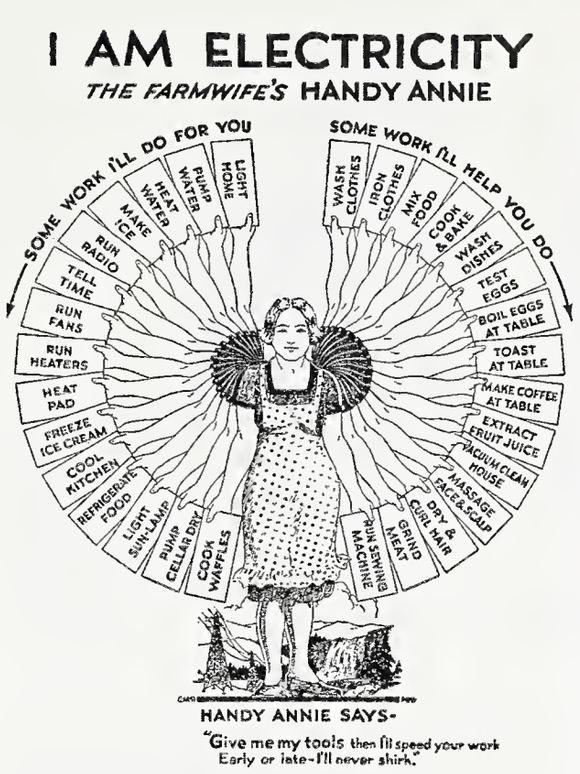
Inventors soon began work on new technologies that could use steam power. Steam engines even opened up new possibilities in established industries like North Carolina's textile industry. Mill owners and managers could hardly believe just one steam engine could power a whole factory building full of textile looms.

But now that humans had been exposed to more powerful technologies, they wanted even more. No longer were manufacturers

Definitions

In order to be of value, power had to be ***distributed****, or carried, from the place where it was created to another place where it could be used. Its* ***distribution system*** *carried or moved the power between locations.*

Mortars and pestles are hand tools used to grind objects like corn into cornmeal. The mortar is a container that looks like a bowl; the pestle looks like a small club.



Even the first advances in power had made work easier. But electricity changed our lives in more ways and with more speed than Thomas Edison could have possibly imagined one hundred years ago. This ad from an April 1933 Fortune *magazine promotes electricity by showing some ways electrical power could lend a helping hand.*

satisfied with one steam engine powering a factory building. Now they wanted an even bigger engine that could power a whole complex of buildings and power more than one process at a time.

Unfortunately, no matter how much power a steam engine produced, that power could be **distributed** for only short distances. At the time, power was distributed from a power source through a mechanical **distribution system** of shafts, gears, pulleys, and leather belts to where the power was used.

Or do inventions and technologies lead to a need for more power?

The age of lightbulbs and electrical distribution

Thomas Edison solved the problem of distributing power by discovering how to extend the limits of steam-generated power between buildings and, in fact, throughout entire neighborhoods, then districts, towns, and beyond. He invented a way to distribute power electrically. He used cables and wires to get power far from its source to distant locations where it could be used.

Now, power could be generated at a source many miles away from its user. This ability to distribute power electrically is the single most important technology that has allowed society to enter the modern age we live in today.

But why did Edison pioneer this distribution system? Interestingly, he had developed an invention, which he called the incandescent lamp, in 1879. And unlike wheels and looms, these lightbulbs could not be powered mechanically by steam. In a way, Edison had created a need for a new kind of power.

In 1881 and 1882 Edison finished building a new kind of distribution system, the first electrical distribution system, to power his lightbulb.

At the time, electric lightbulbs were the only technology that used electricity. Technologies like electric motors and other appliances would be developed because the power was available.

New power sources

Have you decided yet which came first—power or technology? Have you thought that they might grow and develop together and rely on each other?

Can you think of some new technologies that might create a need for more or different power? Or do you believe we will find ways to create more power and then have to invent new ways to use it?

Some Native American tools, like these stones and this shell, may have helped get work done more easily, but they were still powered by arms and weight. The large stone is called a celt and was used as an ax. The smaller stone is a scraper for cleaning animal skins. Shells were sometimes used as hoes.

Carolina College of Agriculture and Mechanic Arts, now North Carolina State University, in Raleigh.

1888
The Salisbury Cotton Mill opens with 224 looms. It will become one of the earliest mills in the state to include the entire process of making cloth, from carding through finishing, in one factory.

1889
Three High Point businessmen incorporate the High Point Furniture Company. One reason they choose High Point is location: it is at the junction of the Fayetteville and Western Plank Road and the North Carolina Railroad. Within twenty-five years, more than one hundred local furniture plants will be able to trace their roots to this first factory.

1894
A Greensboro pharmacist experiments to find a cure for his children's colds. Lunsford Richardson's search results in a "vaporizing menthol salve that combines the best features of both the poultice treatment and the head-clearing vaporizer": Vick's Croup and Pneumonia Salve, now Vick's VapoRub.

1895–1905
Stuart Warren Cramer (see 1906), born in Thomasville, designs and equips one-third of the new textile mills built in the South during this time. Some of his profits are used to establish Cramerton, a model mill community that is said to provide some of the best living conditions in the textile industry.

January 12, 1896
One of the earliest X-ray photographs ("X" signifying the unknown) is made by Dr. Henry Louis Smith (see 1918) at Davidson College. His X-ray of a strangling young girl's throat reveals

The steam engine photographs and the Fortune *ad are from the North Carolina Division of Archives and History. Other artwork is from the North Carolina Museum of History.*

The invisible factory: North Carolina's craft industry

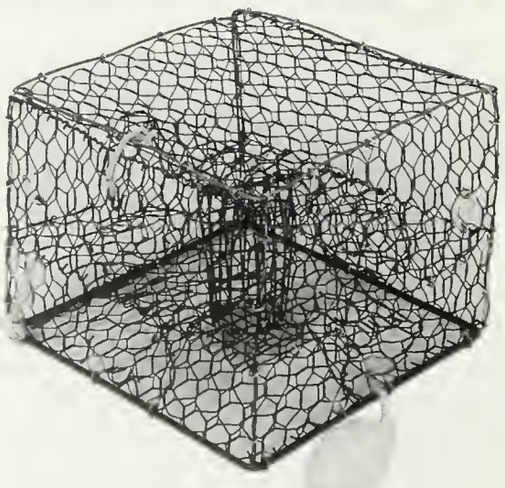
by Becky Anderson

As fast as we can, as uniformly as possible—today we use mass-production techniques, man-made resources, and technological advances to produce most of the goods we need in factories.

But making goods was not always like this. At one time in history, people celebrated personal pride in their final product. One early colonist in North Carolina wrote about men of craft such as carpenters, wheelwrights, tanners, and coopers and women who were soapmakers, starch makers, and dyers.

These early craftspeople applied their own personal touches of art and beauty and balance and uniqueness to the goods they made. They used the traditional methods and the native materials around them to make what they needed. They valued skills with their hands not only for making life's necessities but also as a means of gaining independence, self-reliance, and pride. This was the first craft industry.

During the **Industrial Revolution** and through the birth of mass production,



Today, we have factories that quickly mass-produce items for most of our daily needs. During the early days of North Carolina's history, though, settlers had no factories. Instead they turned to craftspeople to make the items they could not make themselves. Craftspeople learned skills such as cutting and sewing leather shoes, molding candles, shaping wooden shingles (left, above), barrels (below), and wagon wheels, and spinning thread and weaving cloth to make products in most towns. Other skills like blowing glass, forging horseshoes and plows, bending metal into traps (left, below), and making pottery required special supplies, tools, and equipment in addition to learning and practice.

Definitions

When a group or community of people with similar goals and ideas decide to work together, they often form ***cooperatives****, or co-ops, to pool their knowledge and resources. Cooperatives are old ideas. In a craft cooperative, craftspersons all equally own the business—they make their individual crafts, decide how the co-op is operated, and split the costs and profits.*

Objects that focus on ***craft*** *are made chiefly by hand, with special attention paid to detail and skill.*

The ***Industrial Revolution*** *is the period when power-driven machinery, first water-powered, then steam, was introduced and caused a rapid increase in manufacturing production. The period began in England around 1760 and spread to the United States by the mid-1800s.*

Settlement schools are established by churches to serve local communities. They often offer living spaces or dormitories in exchange for work or services provided.

Craft traditions are skills and designs that are handed down from an older generation to a younger one with few, if any, outside influences or "improvements." Traditional crafts are often produced in homes and small communities.

Craft traditions focus on teaching and practicing methods that personalize artistry, balance, and uniqueness. In the past, these traditions have been taught to a younger, interested person by a more experienced and skilled artisan. The generations here share quilting skills during Uncle Eli's Quilting Party, an annual event in Alamance County.

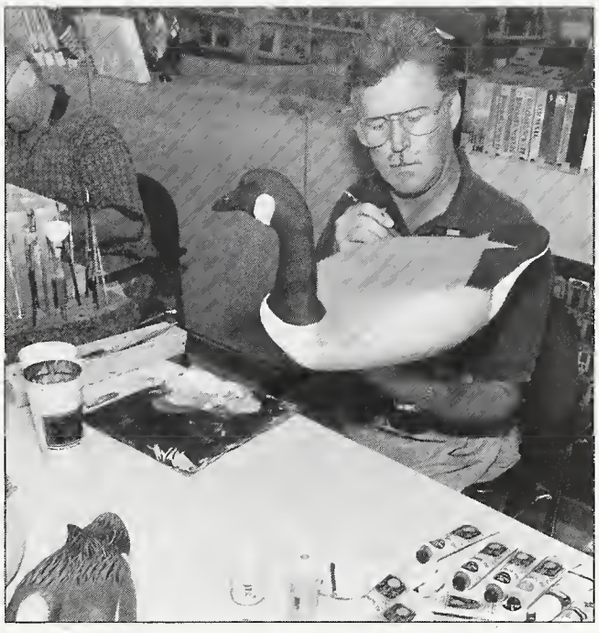
craftspeople became responsible for keeping the knowledge, tradition, tools, and love of handmade objects alive. The products of their craft industries became largely isolated in local home use. In 1933, though, "Miss Lucy" Morgan and a group of weavers from Yancey County, North Carolina, demonstrated their skills and sold woven scarves and bedspreads at the Chicago World's Fair.

People who saw these ladies and their handmade goods in Chicago took note of the role of craft in rural North Carolina. Organizations and **cooperatives** were formed to preserve and promote craft. The first in North Carolina was the Southern Highland Handicrafts Guild. It was followed by the Qualla Craft Cooperative at Cherokee for Native American Craft. **Settlement schools** were established by churches to educate and train people in local **traditions.** Among the earliest were the John C. Campbell Folk School in Brasstown and the Crossnore Weaving Room in Crossnore. Miss Lucy founded the Penland School of Craft in Spruce Pine. This settlement school has become world famous in its teaching of craft to a national and international audience.

During the 1960s, an emphasis on individual expression introduced thousands of young persons to the craft tradition. To make a living in the new craft industry, these people introduced craft fairs, shops, and galleries, assembled private collections, and helped to create new museums and exhibit spaces. In 1995, an organization known as HandMade in America developed the National Craft Heritage Corridor.

Seven loop trails in twenty-one counties of western North Carolina make up the corridor. By following loop trails off the Blue Ridge Parkway, visitors can see more than four hundred historic craft sites like schools, working studios, shops and galleries, and herb gardens as well as lodging and restaurant establishments full of local flavor.

Because the industry seldom requires major water supplies, additional sewer access, or many site improvements and because it rarely asks for tax breaks and produces little, if any air, soil, or water pollution, the craft industry is sometimes called the invisible factory. Today—through the community colleges and independent craft schools of the region; through the area's industrial base in paper, furniture, wood, fiber, and ceramics; and through the natural beauty and raw materials of the mountains—western North Carolina offers the setting that craftspeople need to create and thrive.



Members of the Watermark Association of Artisans, a cooperative in Camden, create contemporary crafts as well as heritage crafts that could have existed in colonial North Carolina. Today's members learn their crafts from training classes at the co-op as well as the old-fashioned way, from more experienced craftspersons. Public demonstrations, like this one, also help teach traditions.

Becky Anderson grew up watching her grandmother weave and has pleasant childhood memories of helping grow herbs to dye the yarn. She is currently director of HandMade in America, which is located in Asheville. Carolyn McKecuen, who is executive director of Watermark Association of Artisans in Camden, also contributed to this article.

Photographs of the barrel and shingle makers are from the North Carolina Division of Archives and History. Other artwork is from the North Carolina Museum of History.

a thimble that is preventing her from breathing. A surgery to remove the hidden thimble saves her life.

1897
In Concord, Warren Coleman founds the nation's first textile factory owned and operated by African Americans.

1898
The first tree farm and forestry school in the country open at Biltmore Estate.

1898
A drink named "Pepsi-Cola" is first marketed. The drink, though, was previously called "Brad's Drink." Caleb Bradham made it in his pharmacy in New Bern.

1898
Fries Manufacturing and Power Company uses water power from the Yadkin River (near present-day Hillsdale, Forsyth County) to become the state's first producer of hydroelectric energy.

About 1900
Beulah Louise Henry of Charlotte imagines her first invention: a mechanical device that will allow a man to tip his hat at a passing woman while leaving both his hands free to carry objects or drive a bicycle. Some of her other inventions will be more practical, though, like finger-contoured pads for

Do you have special places near your home where you go to hear quieter sounds and find life unfolding at a slower pace . . . where you walk among pines or hardwoods and are more aware of the wind whispering through the trees . . . where you stand in an open meadow or a recently plowed field and note a crow's call sharply breaking the silence overhead . . . where you sit at the water's edge and tune in to the song of a river tumbling downstream or the rhythm of waves rolling onto the beach?

You might go alone or with friends or family members. You might go often or seasonally or only occasionally. You might go at different times for different reasons: to walk, swim, explore, hunt, fish, hike, or camp. But just by being there, in pockets of relatively undeveloped space, you notice the habits and habitats of the many plants and animals living on the landscape along with you. They become familiar to you.

Maybe, even in your lifetime, you have known such a place and lost it to changes that are rapidly and dramatically reshaping our state's environment. If your parents and grandparents grew up in North Carolina, they see a landscape very different from the one they knew when they were your age. They look at the shopping malls, suburban developments, industrial or business centers, and interstate highways that surround our growing towns and cities, and they can remember the woodlands and small farms that were there before.

What happened to them? Traditions, land use, and technology

by Amy Brown, Sally Council, Leila Childs, Laura Streitfeld, and Jim White

Technology has given us the ability to make great changes in our **terrain** in order to provide new ways to move around, to communicate, to create, learn, play, and work, to do business, and to entertain ourselves. Some of the changes in the ways we live were intentional and led to expected results. Other changes led to results and consequences that were not anticipated.

Changes in traditions

The decline in the number of family farms in North Carolina is one visible illustration of change in our landscape. The number of farms in North Carolina dropped from 105,000 in 1975 to 58,000 in 1995—a decrease of almost 50 percent in just twenty years.

Tobacco farms are one type of family farm that have long been a visible characteristic and a way of life in our state. Land was handed down from one generation to the next to be farmed. Tobacco was planted, primed (or picked), strung, hung in the barn to dry, graded, tied into hands or bundles, and loaded for market—all by hand. Each process required special knowledge and skill that were passed along from more-experienced persons to younger ones in fields and around barns throughout North Carolina.

Likewise, **domestic arts** and other skills once necessary for agricultural life, were usually learned at home and made use of local materials. Baskets, for example, were used extensively on farms for a variety of functions. They were needed to gather crops from fields and vegetable gardens, collect eggs, catch fish, transport produce, and assist with domestic tasks such as sewing and laundering. Their shapes revealed their purpose. Basket-making techniques reflected the local materials that could be gathered in woods or open areas or marshes nearby.

Community life, too, was once an **integral** part of life on the farm. At harvest or other times when **collective** help was necessary, friends and neighbors gathered to provide extra hands. Business was generally conducted in the local community among people who knew each other. Gifted instrumentalists and singers from local communities made music together on

Definitions

Agri-corporations are large farming businesses that can usually afford large tracts of land and up-to-date supplies and equipment.

Collective help, or a collective, is an effort by family members, friends, or coworkers working together as a group to assist in meeting a common need or goal.

The skills and crafts necessary to run household or family activities are sometimes called domestic arts.

When a part is integral, it is necessary or essential to the whole idea or concept.

Terrain is the geographic or physical features of an environment.

Neighboring musicians used to play and sing together during breaks from farmwork. During the talent show at Awards Day 1995, Blair Overman from Trent Park Elementary School in New Bern played a fiddle tune reminiscent of those traditional sessions (left).

Technological advances in equipment and farming methods during the last fifty years have made farmwork more productive. A collective of workers used to work every day for a week to harvest as much as this self-propelled tobacco harvester (left) with one operator can now do in one day.

front porches, in living rooms, around barns and warehouses, in churches and under revival tents, and at house parties and Saturday night dances.

Changes in land use

As technology has improved, agriculture has become more industrialized. More emphasis is now placed on mass production and large-scale business operations. Maintaining a family farm in competition with **agri-corporations**, as well as increasing urbanization, is not easy. Some farmers or members of farm families have taken additional jobs off the farm to help make ends meet. Others have been forced by economic pressures to sell their land.

Some persons or companies that purchase old family farms do not continue any kind of farming. They buy for development. Land is cleared, bulldozed, paved, and built upon. The ecological functions of farmlands, woodlands, and wetlands disappear along with the fields, trees, streams, and marshes that are destroyed.

Farmland that remains intact is often converted to the large-scale production of crops and animals. Some of these practices have stressful effects on the surrounding environment, too.

For example, last summer millions of fish died in the lower Neuse River as a result of water pollution. This contamination was caused in part by the runoff of hog sewage from large swine industries along the river.

Increasingly, our waters are being contaminated by everyday products in our lives. Pollution from wastewater treatment plants and fertilizers, pesticides, herbicides, gasoline, and other chemicals wash into streams from lawns and golf courses, highways and parking lots, fields, and industries.

Will these trends continue?

In many ways technology has enabled us to make great improvements in the ways we live, improvements we do not want to do without. Because technology allows us to make changes so quickly and on such a large scale, we are discovering new concerns about its impact on our lives and our environment.

Some people in our state are trying to develop solutions to the problems these changes create. They are trying to develop more effective technologies for dealing with problems or lessening their impacts. Some are trying to find more environmentally safe practices for operating large agri-industries and to restrict large-scale developments that damage the environment. Others are trying to return to some of the ways of traditional life or to adopt new ways, so they are more careful with our resources.

typewriter keys, the Dolly Dip sponge (which lathers itself from soap kept inside it), and a parasol that features changeable, snap-on, color-coordinated covers and compartments for a powder puff, coins, and calling cards—her biggest commercial success, selling more than forty thousand in its first three months!

1901
In Charlotte, Thomas Edison experiments with ways of using electricity to extract gold from ore.

1903
North Carolina's first child labor legislation passes the General Assembly.

1904
The Southern Power Company (now Duke Power Company) organizes in part to provide an adequate power supply to the booming textile industry.

1906
Stuart Warren Cramer (see 1895–1905) coins the term "air-conditioning" to describe one of his sixty patents, "an improvement in the humidification [and air cleaning] system for textile factories." As a result of his work with earlier researchers Willis Haviland Carrier and I. H. Hardeman, one of the South's first air-conditioning units is installed at Chronicle Cotton Mills in Belmont. With this quality-control device, Cramer believes southern mills will be able to truly compete with the less humid "fine-yarn" mills of New England. By 1920, other cotton and paper mills, tobacco-related factories, breweries, and bakeries will follow along. Air-conditioning is said to be the largest change to southern life and culture since the abolition of slavery.

The authors are graduate students in the Curriculum in Folklore program at the University of North Carolina at Chapel Hill.

The evening view on Lake Gaston is provided courtesy of Brenda Mitchiner. The photograph of a tobacco harvester is used with the permission of the Flue-Cured Tobacco Farmer *magazine. Other artwork is from the North Carolina Museum of History.*

1913
Assembly lines have started to end the era when people crafted nearly all products individually, by hand. After studying the concepts of mass production that have recently revolutionized automobile manufacturing, Kate Gleason introduces them to housing construction. Each of the houses in her first one-hundred-house development includes six rooms and built-in luxuries like gas ranges, bookcases, and mirrors, yet it is still affordable to working-class families. To make the houses look different, she orients each building differently on its lot and changes window and roof ornamentation, ideas that are still used in today's suburban developments. One of her larger developments will be in Beaufort, South Carolina.

1915
Commercial processing of North Carolina–grown soybeans begins at Elizabeth City. North Carolina is the first state to plant soybeans as a commercial commodity.

1918
The first dam is built on the Catawba River to provide hydroelectric power. The Catawba will become the "most electrified" river in the world.

1919
Sarah Breedlove "Madam C.J." Walker dies. She is the first woman self-made millionaire. After developing formulas for grooming African American hair, she began training an army of saleswomen to sell her hair care and beauty products door to door. Her products, beauty shops, and classes promote straight hair among African Americans, one of the visual parts of the Harlem Renaissance of the 1920s. In 1928, one of her students, Marjorie Joyner of Chicago, will invent the permanent-wave machine.

1923
Spencer Love founds Burlington Mills, one of the first mills to produce cloth from an artificial fiber—rayon.

1927
Charles Strite invents the thermocontact to eject bread during a certain point in its cooking—the first automatic toaster, the Toastmaster.

His gun designs and genius in the area of firearms lead

Few people know that North Carolina is the birthplace of American outdoor historical drama. Today the state can boast that it has twice as many outdoor dramas as any other state. Historical dramas reenact events from North Carolina's past on an outdoor stage, which can add "special effects" like the sky and an entire sound of water as the backdrop for The Lost Colony *in Manteo.*

Tourism: A big business going places

by Paul Cook

Everyone has been a tourist. We all become tourists every time we take a family vacation or go out of town to visit relatives or friends. Although we Tar Heels often think of travel and tourism in terms of leaving North Carolina for fun and vacation away from our homes, many outsiders come into our state, making tourism a big business here.

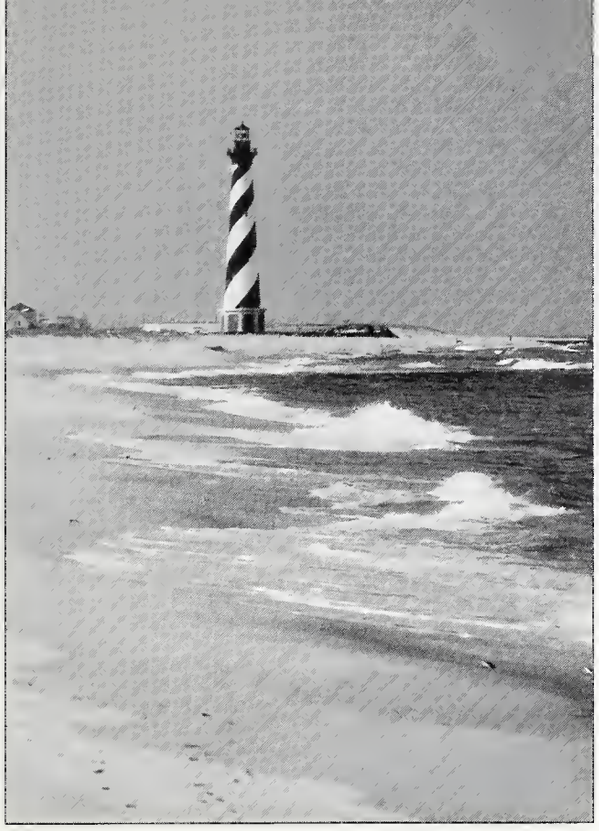
Selling North Carolina

Today, more than 255,000 North Carolinians work in travel-related businesses. These include owners of souvenir shops at the beach, workers at restaurants and hotels in our towns and cities, and operators of ski resorts in the mountains.

Many of the outsiders who come to North Carolina are families and individuals visiting from nearby states. Last year, the state's eight Welcome Centers hosted 8,600,000 visitors. Its inquiry line (1-800-VISIT NC) handled over 280,000 calls, and employees mailed out more than 240,000 travel packages with information about the state.

Other methods are also used to market North Carolina to potential travelers. Advertisements are created and placed in

Believe it or not, the North Carolina mountains have been a tourist destination since the Buncombe Turnpike opened in 1827. A number of inns, cottages, and resorts opened just after 1900 to house summer residents and vacationers in the "Land of the Sky." Inventors Harvey Firestone (far left), Thomas Edison (next), and Henry Ford (fifth from the left), shown here with some local Asheville businessmen, visited Asheville in 1918. Twelve years earlier, Firestone and Ford had provided many mountain residents with their first exposure to the gasoline-powered automobile as they drove through.



Some of North Carolina's most-visited coastal historic sites are its six lighthouses. Cape Hatteras Lighthouse is also surrounded by one of the state's most-visited scenic spots, Cape Hatteras National Seashore.

newspapers and magazines, as well as on radio and television. Travel writers publish articles about the state's natural and man-made attractions. And state and local "ambassadors" attend tourism trade shows to tell travel agents and tour operators about all North Carolina has to offer.

The North Carolina Zoological Park in Asheboro is the largest natural-habitat zoo in the world. Instead of fences, cages, and concrete walls, visitors see wild animals like these rhinoceroses in an open range.

What is so special?

North Carolina is a state of great natural beauty, so it is not surprising that some of the state's most popular tourist spots are scenic. These include the Blue Ridge Parkway, the Great Smoky Mountains National Park, the Cape Hatteras National Seashore, and North Carolina state parks.

Other big draws for tourists are man-made attractions. These include the North Carolina aquariums, the North Carolina zoo, museums, the state's historic sites, and its many outdoor dramas.

North Carolina's historic attractions range from remains of battlegrounds and forts to a gold mine and other connections with technology. These include the Wright Brothers National Memorial, where humans first controlled flight; six North Carolina lighthouses; and the North Carolina Transportation Museum at Historic Spencer Shops. This museum is the South's largest transportation museum. It has examples of transportation methods ranging from dugout canoes to massive steam locomotives.

New industry directions

So it's not hard to understand why tourists want to come to North Carolina. But the competition with other states for visitors is keen. The North Carolina Travel and Tourism Division, administered by the state Department of Commerce, is working to increase the number of visitors from other countries.

Most of North Carolina's international visitors currently come from Canada. The Travel and Tourism Division wants to increase European tourism to North Carolina. The United Kingdom, Germany, and France offer the greatest potential for visitors, and we are now educating European tour operators, travel agents, and travel writers about the Tar Heel State.

Telling people about North Carolina is one of the best ways to get tourists to visit. Another method the Travel and Tourism Division will soon be using to provide information about North Carolina is the Internet. This global computer network will make it possible to promote North Carolina not only with words but also with photos, audio, and even video to a potentially infinite audience.

to the pardon and release of David Marshall Williams from prison. During his lifetime Williams will patent more than fifty firearms mechanisms and will design guns for Colt, Winchester, and Remington. In World War II (1941–1945), the U.S. Army will order eight million semiautomatic rifles known as M-1 carbines. The inventor of the M-1 will afterward be known as Carbine Williams.

1934
The state's tourism industry gets a boost when the North Carolina route of the Blue Ridge Parkway is approved instead of the Tennessee route. The road's construction is also an immediate way out of the Great Depression for families in the Mountain region.

1935
The North Carolina Rural Electrification Authority is established to help stimulate rural power line construction across the state.

1940
Great Smoky Mountains National Park is dedicated. It will become one of the most popular tourist destinations in the country.

1950
North Carolina State University establishes the

Paul Cook is extremely interested in the potential use of the Internet for marketing North Carolina's travel and tourism attractions. He is currently sales and media manager at the Travel and Tourism Division office of the North Carolina Department of Commerce.

Photographs of Cape Hatteras Lighthouse and The Lost Colony *performance are provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce. The 1918 photo at Grove Park Inn in Asheville is used with the permission of the Ewart M. Ball Collection, D. Hiden Ramsey Library, University of North Carolina at Asheville. Rhinos at the zoo is used courtesy of Eric N. Blevins.*

first college course for nuclear engineering. The school will become the first university in the world to offer degrees in nuclear engineering at the bachelor's, master's, and doctoral levels.

1950
The first credit card is introduced. It allows members of a club, the New York Diners' Club, to eat at twenty-seven restaurants in New York City and to leave without paying their bills—until later.

1953
Raleigh Research Reactor, the first privately operated atomic reactor, begins operations on the campus of North Carolina State University.

1959
"Panti-Legs" go on sale with ten sizes and seams up the back. These first pantyhose, credited to Glen Raven Mills near Burlington, are slow to replace girdles, stockings, and garters, though, until a new dress style, the miniskirt, is unveiled in London. Feminist historians say that the invention and development of pantyhose have been the third most important event in freeing women. (The suffrage movement and automatic dishwashers are first and second!)

1960
The North Carolina Works, a division of Western Electric, in Hickory uses one of the first computer-controlled production lines.

Early 1960s
The so-called third generation of computers begins with the introduction of integrated circuits.

1962
A new drug to relieve suffering from gout is administered to patients at Duke University Medical Center in Durham. Developed by researchers at Burroughs Wellcome, a pharmaceutical company in Research Triangle Park, allopurinol is the fourth landmark drug discovered by Dr. George H. Hitchings.

1963
The United States, the United Kingdom, and the USSR sign an agreement to ban thermonuclear hydrogen bombs. Since then, China, France, India, and Israel have gained the knowledge needed to make or test such bombs.

Lights, camera, action: Filming North Carolina

by Jodie Kinnett

Carolco Studios in Wilmington is one of the largest film studios on the East Coast. Large buildings at the front of this sketch provide space for inside sets, soundstages, and technical facilities to produce films and television programs. The "back lot" provides building fronts and outside sets. Fronts of these fake buildings can be changed to reflect different time periods and locales around the world. Other studios have been built in High Point and Yanceyville, and film commissions and popular filming locations now exist across the state.

When moviemaking began in the late 1800s, movies were silent. Audiences heard no sound. Even years later, they saw only black-and-white images of stars like Charlie Chaplin, Buster Keaton, Lillian Gish, and Mary Pickford. Sounds of rinky-tink piano music played in the background while words appeared written on the screen.

Filming started slowly here

In 1928 one of these silent films, *Stark Love,* was made in North Carolina. And following a start in silent-film serials, Salisbury native Sidney Blackmer landed his first starring role in one of the earliest "talking" films, *A Most Immoral Lady* (1929). But the film industry did not truly get a strong start in the state until years later.

Heavy sound equipment limited most production to sunny southern California near the big studios. But as film equipment became more portable, movie producers also found themselves with a new competitor—television. They became very interested in doing things television producers could not do. One of those things was "shooting" films "on location" to make them more realistic looking. Movie producers would do that by filming all over the country.

Biltmore House in Asheville was one of the first spots in North Carolina to be discovered by Hollywood. The Civil War film *Tap Roots* was made there in 1948, then *The Swan* in 1956. The town of Asheville was the site of *Thunder Road* in 1957. By the mid-1960s, Carmel Productions in the Charlotte area was making a host of low-budget movies for drive-in theaters. Earl Owensby established a studio facility in Shelby in 1973.

Filming becomes a Tar Heel Industry

The pivotal year for North Carolina's modern film industry was 1980. That year Lorimar Productions released *Being There*, a Peter Sellers film made at the Biltmore Estate. And Governor James B. Hunt Jr. established the North Carolina State Film Office. The state office's function was to recruit movie business to North Carolina and to boost development of the film industry here.

In 1984, Dino DeLaurentiis, an Italian filmmaker, enlarged an old warehouse in Wilmington to make what became one of the largest film studios on the East Coast. Located halfway between production centers in New York and Florida, the business in Wilmington quickly grew.

Camera operators, sound mixers, gaffers (who handle electricity for cameras, lights, and other equipment), makeup artists, actors, stuntmen, animal trainers, and many others who have a role in film production flocked to the town to work on films being made there. During the next five years, a few of the films DeLaurentiis produced there were *Crimes of the Heart*, *Firestarter, Cat's Eye,* and *King Kong Lives.* In 1989, he declared bankruptcy and Carolco Pictures, a Hollywood studio, bought the facilities.

With Carolco Studios, Wilmington continued to be a hub of film activity,

churning out *Super Mario Brothers, Sleeping with the Enemy, The Crow,* and *Weekend at Bernie's*, to name a few. Television series like *Matlock, The Young Indiana Jones Chronicles,* and *American Gothic* were also shot there.

Filming expands across the state

Fueled by increased activity in Wilmington, film production spread to other parts of the state. *Nell* (1994), for example, was filmed in and around Charlotte and Robbinsville, *Last of the Mohicans* (1992) and part of *Richie Rich* (1994) around Asheville, and *Bull Durham* (1988) and *The Program* (1993) near Raleigh and Durham. *Eddie,* shot in Charlotte and Winston-Salem, and *Lolita,* shot around Wilmington, Spencer, and Reidsville, will appear soon.

In recent years Wilmington, Durham, western North Carolina, the Winston-Salem/Piedmont Triad area, and Charlotte have each established local film commissions to recruit and work with film producers by helping them find locations and crews. Film studios have been built in High Point and Yanceyville. In addition, the state of North Carolina further invested in the industry by establishing a film school in 1993 at its School of the Arts campus in Winston-Salem. Other schools have followed suit. For example Wake Technical Community College has developed unique programs like Computer Graphics Technology to teach the visualization and use of special effects in filming.

In the future, film production will probably continue to grow outside of Los Angeles because costs continue to be cheaper in other parts of the country and in Canada and because the growth of cable and satellite television means an ever-increasing demand for new films.

1964
Ernest Garner, a Charlotte woodworker, dies at age 87. Garner's simple and convenient contribution to the world of home storage was the disappearing attic stairway.

1965
The first North Carolina minimum-wage law is enacted.

1967
The first home microwave oven is marketed. The technology is more than twenty years old.

1991
Coca-Cola introduces new recyclable, plastic bottles made by the Southern Container Corporation in Enka.

1995
Deparx Stimson dies in his hometown of Winston-Salem. Stimson patented the heat pump nearly sixty years ago. But his technology remained largely unknown until the 1970s, when people and businesses finally began looking for economical air-conditioning. During his lifetime, Stimson helped NASA develop cooling systems for its rockets and also experimented with solar refrigeration.

North Carolina's film industry exists because of advances in technology. Early moviemaking equipment was too large and heavy to move far from major studios in southern California. But as technology allowed smaller and lighter cameras, lighting and sound equipment, and mobile "props" and sets, producers chose to "shoot" films "on location." The movies that resulted looked more realistic and also gave films a competitive edge over television.

Some recent films and television shows produced partly or entirely in North Carolina*

Amos and Andrew (1993, PG-13)
"Andy Griffith Show Reunion" (TV)
Being There (1979, PG)
Bull Durham (1988, R)
The Color Purple (1985, PG-13)
D.A.R.Y.L. (NA)
"Dare to Be Great" (NA)
Date with an Angel (1987, PG)
Dirty Dancing (1987, PG-13)
Dream a Little Dream (1989, PG-13)
"Face on the Milk Carton" (NA)
Foxfire (1987, PG)
The Fugitive (1993, PG-13)
"Gramps" (NA)
Hunt for Red October (1990, PG)
Last American Hero (1973, PG)
Last of the Mohicans (1992, R)
Lost in America (1985, R)
Matlock (the TV series and three films)
My Summer Story (1994, PG)
Nell (NA)
"One Christmas" (NA)
"Ordinary Heroes" (1985, NR)
"Over the Summer" (1984, NR)
"The Petty Story" (NA)
Richie Rich (1994, PG)
"The Ryan White Story" (TV)
"Sherman's March" (1986, NR)
"Tecumseh" (NA)
Teenage Mutant Ninja Turtles (NA)
Too Young the Hero (NA)
"Where the Lilies Bloom" (1974, G)
Wildflower (1992, NR)
Young Indiana Jones Chronicles (TV)

** Feature films and television series are in italics; series episodes and specials are in quotation marks. Productions on this list have not been previewed or evaluated, and inclusion is not a recommendation for viewing. Release dates and ratings are based on information found in video catalogs, but be sure to check guides for reviews and additional information. NA means the production was not listed in video catalogs.*

Jodie Kinnett has been assistant director of administration at the Winston-Salem/Piedmont Triad Film Commission since 1994. At Davidson College near Charlotte she majored in English literature but also loves art history. And guess what—she loves movies, too.

The Carolco Studios print is used with the permission of Carolco Studios, Wilmington. The location shoot is from the North Carolina Division of Archives and History.

The earliest ways of traveling were on land by foot and over water in some kind of craft. Water was probably the more important because larger amounts of goods could be moved with less effort. Ports along the coast could be reached by traveling the sounds, and interior towns, at least as far as the fall line, could be reached by river.

Our moving economy: Transportation and technology

by Robert E. Ireland

Imagine how different life would be if there had never been technological improvements in transportation.

Think what it would be like if no trucks traveled the highways day and night to provide fresh food, clothing, fuel, furniture, and practically everything else that is sold in retail stores. We would have no cars to travel to and from work in, to vacation in, to go shopping in.

In fact, without modern transportation the economy of North Carolina would be limited to small farms and communities where most people would produce goods only for their own use. You would have almost no physical contact with anyone more than a few miles away. If you relied on written news, you would have a general lack of awareness about the rest of the state, nation, and world because newspapers and magazines would take days, weeks, even months to arrive.

Can you see how transportation has always been a very important factor in the growth and development of North Carolina's economy?

Definitions

The fall line, or fall zone, is an imaginary line that connects the locations on rivers where you would first encounter waterfalls as you travel inland. Above the fall line, rivers are more difficult to navigate.

In North Carolina, interior places are inland, away from the coast.

The age of water transport

During the colonial period, people and goods arrived at and departed from port cities along the coast. From these port cities, North Carolina was connected with the other colonies and with England, the West Indies, and the rest of the world.

Rivers also connected the Coastal Plain with **interior** locations. Interior towns were often settled along rivers at the **fall line.** Rivers served as the chief means of transporting raw materials, such as timber, livestock, naval stores, and supplies, between these towns and ports at the coast.

Unfortunately many of the colony's rivers were not navigable above the fall line, so people and goods were often transferred from water to land to get farther inland or from land to water to reach the coast. Still, since the few roads in the colony were often impassable throughout the muddy months of March, April, May, and sometimes June, even inland rivers were used as much as possible.

But the use of rivers for transporting goods and people had its limits. Some waterways became too shallow during long dry periods or too dangerous at flood stage. The most serious limitation of water travel was the location of a stream or river, sometimes far from the raw materials that needed to be shipped or the destinations that needed them.

The apparent answer to this problem was to build a series of canals to connect riverways with each other and with towns that were not river ports. Canals were also

As settlers began moving above the fall line and into the backcountry Piedmont, land travel became more necessary. But dirt and clay roads were often muddy and impassable during much of the year. Many types of road-building technologies, like plank roads and macadamizing (placing a layer of tar between three or more layers of increasingly larger stone), were used over the years. This log road and bridge near New Bern, Craven County, are other examples of road technology. Logs were cheaper and less valuable to thieves (who sometimes "acquired" planks from roads to use on the sides of their houses) than plank roads but were still an improvement over mud and clay.

more reliable during droughts and floods because water levels could be raised and lowered by systems of gates and locks. A number of canals were built in North Carolina in the 1830s. However, other advances in transportation technology were soon to replace the canal as the most effective means of shipping goods to market.

The age of steam transport

In 1818, steam-powered paddle wheelers began operating on the open waters of Pamlico and Albemarle Sounds to provide transportation between New Bern and Elizabeth City. Soon after, steam-powered riverboats were quickly and reliably transporting cargo upriver without the expense of building or maintaining a canal.

Steam-powered land travel was also arriving in North Carolina. Steam-powered railroad engines could haul heavy loads for long distances to locations, practically anywhere, where tracks could be laid. The first major railroad in North Carolina was the Wilmington and Weldon line, completed in 1840.

After the Civil War (1861–1865), North Carolina continued to see the expansion of rail service. Lines into the western mountains opened the area to new industries like tourism and the harvesting of natural resources such as timber and minerals. Eventually, the difficulty of carrying goods and resources to railroad lines began to plague producers. It was at this point, in the late 1890s, that another technological development occurred that solved that problem.

The internal combustion gasoline engine was invented in Europe and adapted in the United States by Henry Ford for use in "horseless carriages."

The age of gasoline transport

Improvements in the technology of transportation have always been closely related to the use of newly developed fuel sources. During the period from 1790 to 1990, for example, the fuel needed to provide transportation changed from grain (for horses and mules), to wood (for steam), then coal (also for steam), and finally petroleum (for gasoline and diesel engines).

The gasoline engine was only one of three competing systems used to power the earliest horseless carriages. Steam engines, which by then had long been used in locomotives and ships, were slow to start, since a fire had to be built to heat water in a boiler and create steam. Electric cars suffered from a frequent need to recharge their batteries, which seriously limited their range of travel. Thus, the gasoline engine won out over its two older competitors because it provided the most power for the longest distance. By the 1920s, gasoline engines were powering not only automobiles but also buses, trucks, tractors, and airplanes.

A revolution in transportation and how we live occurred because of the gasoline engine. More and more people began traveling. Recognizing the potential of the motor vehicle, North Carolina responded in the 1920s by constructing a massive network of paved roads and bridges that would span the state. In the years since, interstate highways and huge airports have been built to allow even faster means of travel.

Now, too, it was possible to start new businesses on the outskirts of a city and to build single-family houses in areas within automobile traveling range. These areas were called suburbs. As people ventured farther from cities, it also became advantageous to create shopping centers and malls outside the city. Today we are seeing cars take people farther away from cities to more rural areas we call exurbs.

What do you think the growth of exurbs will mean to our future? Do you see further changes in lifestyles or traditions?

As a youth in Maine, Robert E. Ireland spent hours drawing cars, jets, and baseball players before becoming interested in history. After moving to North Carolina in 1986, he wrote a book, Entering the Auto Age, *and became a college history professor. He is now a teacher and counselor at Wake Technical Community College in Raleigh.*

The river scene photograph is provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce. All other artwork is from the North Carolina Division of Archives and History.

In the early 1900s road-building projects like the Carteret County Million Dollar Road Program helped spread hard-surfaced roads across the state. Ironically, steam-powered equipment like this steamroller (above) and animal-powered equipment like this grader (left) were often used to build roads for their replacements—gasoline-powered vehicles.

A journey up a river

by Roger B. Allen

Colonial North Carolina was a land with many swamps and wate trees. Native Americans had taken advantage of this supply of trees mode of water transportation—the kunner. Early European settler access to the construction knowledge for building plank boats that w have the necessary waterpower to power sawmills to make planks. actually the application of modern metal tools to the Native Americ demonstrated in Cherokee (above and below), this technology uses re scraping. As basic as kunner technology was, the crafts were adapta

So you find yourself walking into a strange forest one day trying to get from Norfolk in the Virginia colony to some place where the Trent River meets the Neuse River. You have no idea where you are going, but you are willing to go because you have one thousand acres waiting for you. All you have to do is get there, build a house, and live there.

For more than a week you walk, hacking and chopping your way through the wilderness and wading through snake-infested swamps. You bear the heat because air-conditioning will not be common for almost three hundred years. You walk through clouds of bugs because, except for the bear grease you learned to use from the Native Americans, insect repellents will not be invented for nearly three hundred years.

After days of slow, difficult travel, you hit a big river that could go on for miles in either direction. You are stuck on the wrong side, and no bridge will cross it for at least fifty years.

What about building a boat?

Then you think—all you need is a boat. Of course you have none around, so you will have to build your own.

You remember seeing boatbuilders on the beach back in Virginia bending sawed planks and nailing them onto frames to form the side of a boat. Whole communities there work in the industry of sawing planks and building boats and ships.

Where will you get planks and other supplies that you need to put together a plank boat? You are not likely to have access to a sawmill, since sawmills are advanced technology, especially in these backwoods. You have no power—no electricity, no steam, no waterwheel. If you really wanted to, you could build a sawpit to cut planks, but you would first have to dig a trench seven or eight feet deep, build a sawing frame, and find a partner to help you saw. And you would have to have a saw!

Instead of using planks, you decide to make the kind of dugout boat the Native Americans have long built. After all, the area is full of cypress trees. They are free and, in some cases, just in the way.

That is the way it was in the part of North America that became North Carolina. The early Native Americans did not have metal tools to saw and shape their boats, either. They used fire to burn around a tree trunk until the tree fell. They hollowed the fallen tree by starting a fire on the top side of the log and letting it burn. They then used bone, antler, and shell tools to scrape away the charred wood. They burned and scraped again and again to dig a little deeper into the log until they finally got a hollow deep enough to sit inside. That was the earliest North Carolina boat technology.

Well, at least you have your ax, you think, as you fell your tree and start shaping your "kunner," the coastal Carolina word for the Native American canoe.

When you finish chopping, you load all of the gear you were carrying on your back, step in,

Definitions

Many ships have wrecked in the shallow waters beyond North Carolina's Outer Banks. Since this area is the resting place for so many ships, it is often nicknamed the Graveyard of the Atlantic.

Intracoastal canals were dug along the coast to provide a safe, reliable route for water transportation that could remain passable during droughts, floods, or storms. Today, these canals and a system of "improved" (dredged and channeled) rivers and other waterways, like North Carolina's sounds, make up an entire transportation network. Called the Intracoastal Waterway, or the Inland Waterway, it connects Maine to Florida and even Texas—all without ever entering the Atlantic Ocean or the Gulf of Mexico.

Naval stores are the products used in boat and ship construction that were among the most important products exported from the colony. Logs were some of these products, and selling them was one of the few ways of getting money.

t to be crossed and a limitless supply of rticular the cypress, to make their ed boats, too. But they did not have n the current technology. Nor did they sulting technology of boatbuilding was y of building kunners. Still l stages of burning, chopping, and ugh to be used into the 1900s.

and shove off. Out on the water a nice breeze is blowing to keep the bugs off. It keeps you cool, too. And you can actually see the sun, so you know which direction you are heading. What a nice way to travel!

The Tar Heel way

While the European and colonial boatbuilding industries had evolved to using plank construction for boats, none of that technology existed in the backwoods of the Carolina colony. Shaping boats from logs was a logical technology created by the area's need for boats, its lack of waterpower and boatbuilders, a limitless supply of trees, and the high cost of planks.

Remember, being part of the **naval stores** industry was one of the only ways early Tar Heel colonists could earn a living. Selling logs to a sawmill earned good money. But why spend the few hard-earned dollars you made in a year to pay for planks and a boatbuilder to build a boat?

Even when the power and technology to run local water-powered sawmills arrived in the 1700s, few people could afford to buy planks.

A new coastal industry

Besides providing basic transportation along the coast, the heavy, round-bottomed kunners allowed fishermen to catch herring, shad, menhaden, and other fish. As towns grew upriver and inland, their residents wanted fresh fish to eat. And as steamboats began running on the new **intracoastal** canals and no longer had to brave the **Graveyard of the Atlantic** to travel north, northerners also began to demand North Carolina seafood. So fish were caught, salted, and shipped in wooden barrels to local and northern markets.

Kunners were refined and changed until they evolved into the distinctive North Carolina shad boat. Still, a type of boat was needed that could travel farther into the sounds and catch larger numbers of fish. The solution came after the Civil War, when a man named George Ives arrived from New Haven, Connecticut.

Ives was interested in oystering. But the oyster beds of New Haven had been depleted. He heard about the still-rich beds in North Carolina's shallow sounds. When he came south, he brought with him a flat-bottomed yankee boat called a "sharpie." The sharpie was a fast sailboat, much faster than the fastest shad boats, and could sail into areas that had not been accessible before.

Sharpies were made from planks instead of logs. Though planks had already become affordable to the general population, the fact that a sharpie could pay for itself with a dozen bushels of oysters made it all the more attractive. Like kunners, sharpies could be built by anyone with a fair amount of woodworking skill and just a few tricks of the boatbuilder's trade.

Eventually many varieties of flat-bottomed boats were designed and built for the waters of our state. As rowboats; shove, or poling, skiffs; and sailboats, they carried everything from mail to groceries in many communities that were more easily reached by water than by land.

You might still see a few sharpies being used for pleasure sailing, but working sharpies, like their older relatives the kunners and shad boats, are more often seen in museum collections now. But you might see some of their descendants—the engine-powered shrimp boats, charter boats, and sportfishing boats for which the state's modern boatbuilders are so well known.

North Carolina transportation:

A chronology of invention and technology

1584
The first English explorers sail from Plymouth, England, for North America. After a journey of a little over two months, their two ships will arrive along the coast of what will become North Carolina.

1740s
Scotch-Irish and German settlers are traveling down the Great Philadelphia Wagon Road to North Carolina's Piedmont. Much of the road was originally a trading path used by Native Americans.

1781
Benjamin Heron's drawbridge over the Northeast Cape Fear River near Castle Hayne is burned by British troops. Built around 1768, it was one of only a few drawbridges in the colonies.

1790
The Dismal Swamp Canal is chartered to connect Albemarle Sound with the Chesapeake Bay. Construction on the Dismal Swamp Canal will begin in three years. Pieces of today's Intracoastal Waterway system follow part of the path of this early transportation route.

Roger B. Allen has sailed *across the Atlantic Ocean and the Mediterranean Sea. He teaches the craft of building wooden boats and has an extensive library about voyages in small (twenty-five-foot and smaller) boats, mostly prior to World War I (1914–1918). Allen started the North Carolina Chapter of the Traditional Small Craft Association. He currently works at the North Carolina Maritime Museum in Beaufort.*

Both photographs in this article are provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce.

1818
The *Prometheus* is the first steamboat built in North Carolina.

1818
The Neuse River Navigation Company operates a steamboat between Elizabeth City and New Bern. Robert Fulton, on the Hudson River in New York, had begun operating the first successful commercial steamboat only eleven years earlier.

1819
Archibald DeBow Murphey presents a formal report on internal state improvements to the General Assembly. Among his recommendations are deepening inlets through the Outer Banks to increase foreign trade with North Carolina ports, building canals to connect those coastal ports with major Piedmont rivers, clearing those rivers to make them more navigable and to increase trade with towns along them, and improving roads to link those towns and allow trade to grow farther inland.

1827
Completion of the Buncombe Turnpike starts an economic boom to the Mountain region of North Carolina. Mountain farmers can now get their produce to markets outside the region, and tourists can now travel to the mountains by wagon, carriage, or stagecoach rather than on foot or horseback.

1828
An experimental, or horse-drawn, railway in Fayetteville carries freight from the Cape Fear River to warehouses on Bridge and Person Streets. In five years, an experimental railway will be used to move stone from quarries in Raleigh to the site of the new capitol.

1833
The first true railroad in the state is completed. It connects Petersburg, Virginia, with

Technology and big-time fishing

by Kathleen S. Carter

For more than one hundred years, commercial fishers along the coast of North Carolina have depended on fish, oysters, shrimp, blue crabs, and other seafood for their livelihood. Their catch of fish has provided food for our tables, oil for paints, soaps and cosmetics, and fish meal to fertilize gardens and fields.

Today more Americans are turning to seafood as a healthy source of protein in their diets. The demand for other fish-related products, like oil and fish meal, also continues. In response, commercial fishers have developed new technologies to increase the size of their catch.

When commercial fishing became a major source of income for coastal residents in the mid-1800s, it was done mostly using small vessels and human labor. Crews of two to six men fished from kunners, skiffs, or dinghies in shallow waters near shore. Their nets had to remain fairly small, since they were hauled into the boats or onto shore by hand.

Even today, many people continue fishing with these small-scale practices in the sounds and along the coast of North Carolina.

But for the most part, fishing vessels and their crews have become larger. Large-scale fishers routinely drive their diesel-powered vessels into deep waters in search of menhaden and other species of fish. Sometimes a crew might consist of thirty or more men who work together to haul giant nets onto the deck of their 70-to-190-foot-long vessel.

Following World War II (1941–1945), the fishing industry became more dependent on technology and machinery. Today huge nets can be used to harvest fish because materials are stronger and hydraulic **winches** are capable of hauling tons of—as many as half a million—fish out of the water at a single time. "Spotter" planes that fly ahead of a fleet of vessels can locate giant schools of fish easily from the air. These large-scale fishing techniques have served the growing needs of the consumer market well.

Environmental problems of fishing technology

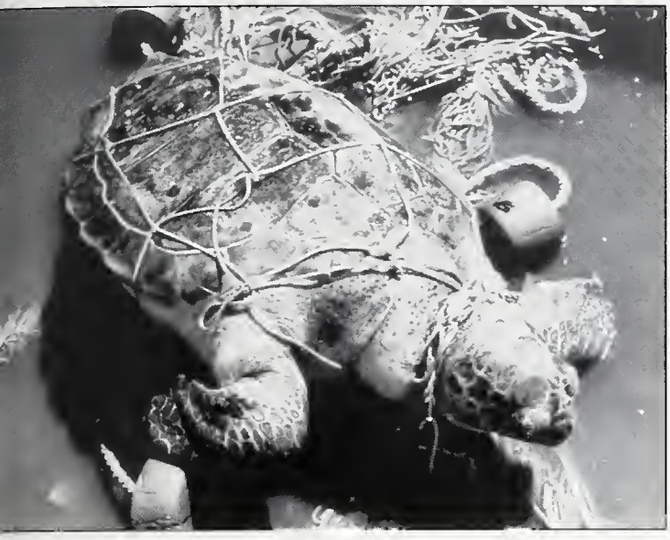
Environmentally, however, this type of large-scale fishing, which has dominated the industry since World War II, has created problems. As more fish are caught, fewer are left to reproduce themselves. The big, machine-driven nets can catch and accidentally kill animals like bottle-nosed dolphins and loggerhead turtles. These nets

In the days of fishing before machinery and technology, these menhaden fishermen heaved together with their hands to raise nets full of fish. They pulled in rhythmic unison by singing songs called chanteys. That tradition ended in the late 1950s as hydraulic winches were installed on fishing boats.

Definitions

A vessel, in this case, is another word for boat or watercraft.

Winches are mechanical devices that are often powered by engines or motors that turn a drum. As the drum turns, a rope or cable is shortened by wrapping itself around the drum and lifting or pulling an object toward it.



Turtles like this one are sometimes accidentally trapped and injured or killed in today's massive fish-harvesting nets. Solutions to this and other problems are not easily found, but newer technology and concerned groups are trying.

also harvest fish species that end up being discarded because they cannot be sold. These "trash fish" are species like skates, sea robins, and puffers that do not have a market in America as food fish. Also accidentally harvested in the great nets are undersized fish that cannot be legally kept but are too injured to survive when returned to the sea.

The solutions to these problems are not easy or popular ones. Many coastal families depend on commercial fishing for their income. For this reason, many commercial fishers understandably oppose efforts to limit their catch or to regulate their industry. Consumers, too, play a part. As long as you help make a demand for tons of fish, fishers will seek to continue their large-scale practices.

What will happen now?

Even though consumer demand for fish and fish products has increased, North Carolina's own catch has been decreasing. In 1985 the combined catch of all species of fish that came into the port of Beaufort–Morehead City weighed 133,200,000 pounds and was valued at $22,700,000. By 1993 the same port saw only 88,400,000 pounds valued at $15,600,000. This decline suggests that the number of fish available for harvest has decreased in the waters off North Carolina. How to reverse this process is one of the problems that needs to be solved.

A few solutions have been implemented. North Carolina's government determines when some species can be fished. The state has also established size limits on some species. Flounder that are smaller than thirteen inches, for example, have to be released back into the water. To help solve other problems, federal regulations now require the use of special nets that will not catch and kill endangered species like sea turtles.

The environmental concerns created with the development of large-scale commercial fishing will probably continue. Will consumers be willing to eat fewer fish in order to conserve species? Will a scarcity of fish force prices to become too expensive for buyers, reducing consumption? Will fishers be willing to accept limits on their incomes to ensure the survival of more fish for replenishing species? Will the technology of fishing continue to develop so that undersized fish and endangered species do not accidentally get caught in nets? These are questions that must be considered as we continue toward the 2000s.

Consumer demand helps to drive the fishing industry of North Carolina. Demand for fish has increased in recent years. In 1970, for example, Americans consumed an average of 11.7 pounds of fish per person. By 1993, that amount had increased to 14.9 pounds. Besides fish for food, fish meal, oil, and other by-products are used as ingredients for other types of goods, like fertilizers, which are also increasing in use.

Blakely, a town near Weldon on the Roanoke River.

1840
After seven years of fund-raising, arguing, and building, the Wilmington and Weldon Railroad is completed. Originally slated to terminate in Raleigh, the northern end has been moved to Weldon, which is already a railroad town, when Raleigh shows no interest. Once finished, the 161½-mile track is the longest route under one charter in the world. The Raleigh and Gaston Railroad also opens in 1840.

1849–1856
The North Carolina Railroad opens in sections between Goldsboro and Charlotte. Riders are excited at the great speed of the trains—about 14½ miles per hour! Towns along this transportation corridor will soon lead the state in population growth and industrial development. The area will become known as the Piedmont Crescent.

1854
A plank road connecting Fayetteville with Bethania, near Salem, is completed. At 129 miles, the Fayetteville and Western Plank Road is the longest plank road in the world.

1859
Cape Lookout Lighthouse is built to make shipping traffic along the coast safer.

In addition to researching the New South of the late 1800s and the oyster industry in North Carolina, Kathleen S. Carter visits the Outer Banks to camp, fish, and eat seafood every chance she gets. A "true Blue Devil," she has her Ph.D. from Duke University in Durham and is currently an associate professor of history at High Point University.

The photographs of the imprisoned turtle and the menhaden fishermen are provided courtesy of the North Carolina Maritime Museum in Beaufort. The fleet photo is provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce.

1874
Stagecoach service to Charlotte is discontinued. Travelers now use trains, which cover much of the state with nearly 3,100 miles of track.

1887
Electricity has proven itself in Charlotte now that electric lights have been installed. Within five years, electric-powered streetcars will even replace the horse-drawn service that started earlier this year.

1888
Jerome Bolick, a buggy manufacturer in Conover, obtains four patents for a steel buggy wheel made with steel spokes. Advertisements brag that his "steel spokes [can be] replaced in five minutes using a monkey wrench"—much better than waiting for a wheelwright to disassemble an entire wooden wheel, carve a spoke to fit, and then reassemble—a process that takes at least a couple of hours. Interestingly, most of Bolick's sales are to the North, where he buys his steel.

As clean and quiet as a fish: Electric boats

by Douglas Little

Electric boats use electric motors as their primary means of propulsion. What sets an electric boat apart from an electric-powered boat is the degree to which the power source, the power control system, and the motor are incorporated into the design of the boat. Any boat can be modified with components or fitted with an electric motor after construction to become an electric-powered boat. But the parts of electric boats are designed to be concealed, balanced, comfortable, and convenient from the start.

Of all the ways to move a boat across a body of water, none is quieter, more efficient, or safer for the environment than the use of electricity.

A boat that uses electric **propulsion** produces no chemical or noise pollutants as do **fossil fuel**–powered watercraft. A small electric boat can run for roughly twenty-five miles on about twenty-five cents worth of electricity purchased from a **utility**.

North Carolina has four builders of electric boats. That number may not sound high, but consider that California, New York, and Florida have only two builders each. Electric propulsion systems can be built and added to any boat at any time.

The technology of electric boats

Electric boats, or boats that are powered with electric motors, have been around so long and are so easy to maintain and operate that it is hard to imagine them as technology. Electric boats are not a new idea and were very common at the turn of the century. In fact, the first outboard motor was electric. Electric motors are very reliable, require no tune-ups, and start at the flip of a switch or the turn of a knob.

An electric boat achieves its efficiency and clean operation by a **propulsion** system made up of a battery bank, a control system, and an electric motor. The motor turns a propeller to move the boat.

A battery bank plays the same role as the fuel tank of a fossil fuel–powered boat. In fact, the biggest difference between a fuel tank and a battery bank is that the battery bank weighs the same whether it is charged or discharged, while a fuel tank is heavier full than empty.

A control system connects the battery bank to the motor. It allows the motor to be operated at different speeds. Once a switch is "thrown," power from the battery bank is delivered to the motor through the control system.

Pollutionless boats

The amount of pollutants created by a **utility** to recharge batteries is very small in comparison to the **source emissions** produced by **fossil fuel**–powered watercraft. But by using photovoltaics, or solar cells, an electric boat produces no pollution at all. Photovoltaics produces electricity directly from sunlight. Solar cells can be used to power a boat or to recharge battery banks when a boat is not in use.

Forty square feet of solar panels would be needed to move a small boat twenty-five miles in eight hours—in good sunlight. Unfortunately, this is more surface area than most small boats can afford. Unfortunately also, batteries would still be required to

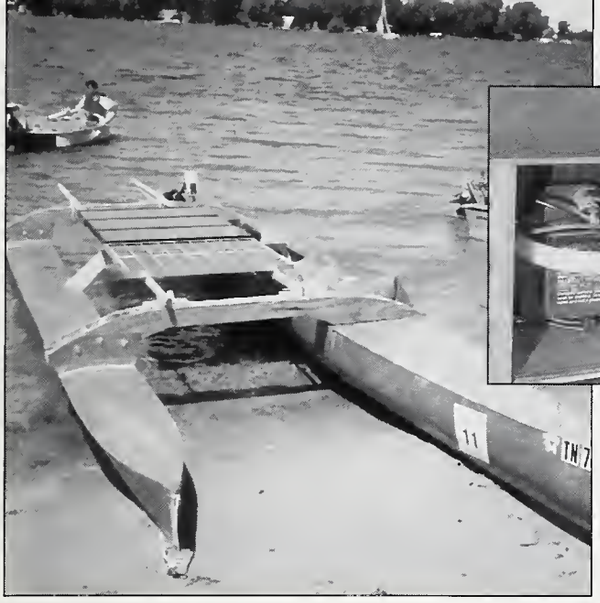
Definitions

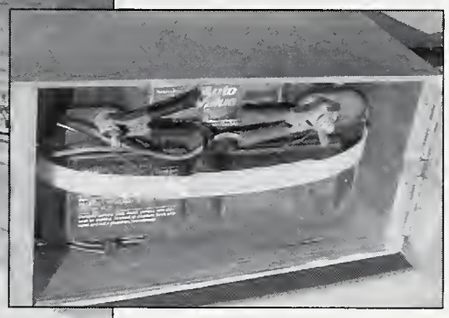
An energy source formed from the remains of plants or animals that lived millions of years ago is a ***fossil fuel****. Coal and petroleum-based gasoline are the two most common types of fossil fuels.*

A ***propulsion*** *system is a driving force that makes an object move, for example the electricity that makes an electric boat move through the water.*

Source emissions *are exhaust gases or chemical residues that escape from the source of a fire, in this case the visible smoke, invisible gases, and greasy "oil slicks" left behind after an engine burns its fuel. With an electric boat, source emissions are controlled at the power plant that generates electricity to charge or recharge batteries. Neither charging the batteries nor using their energy creates any emissions.*

In this case, a ***utility*** *is a company that produces and sells power.*





Electric boats powered by energy generated by photovoltaics, or solar cells, instead of energy stored in batteries are not as heavy and do not require recharging time. The disadvantages to solar cells are size and expense. As usual for an electric boat, the cells on a boat, like this experimental outrigger canoe, are incorporated into the design of the boat and do not interfere with its function. So size is not often a real problem. Solar banks can also be incorporated as a canopy or roof. Five panels, like those on this craft, however, cost about one thousand dollars.

Most electric boats are powered by energy stored in batteries. And battery-driven boats have three basic disadvantages. Batteries in most electric boats are very similar to the batteries that start automobiles. They are very heavy—one of the reasons that electric vehicles of most types are not always practical. Just forty-eight ounces of gasoline can provide more power than can be stored in sixty pounds of lead-acid batteries. In a boat, however, this additional weight has less effect than it would in another type of vehicle like a car or an airplane. (Yes, an electric airplane has flown across the United States using solar cells and ninety-six flashlight batteries!) Another reason electrics are not always practical is recharging time. Batteries can seldom be recharged as quickly as a gas tank can be filled. The last of the primary disadvantages is speed. No matter how many batteries are used, the maximum speed for an electric boat is about fifty miles per hour.

operate the boat in conditions after dark or when the sunlight is not strong. Unfortunately again, solar cells are very expensive. Forty square feet would cost several thousand dollars.

But electric boats have a very promising future. They have a definite place in our world. For people who are concerned for our environment, who want to move slowly enough to see the sights around them, and who want to be quiet enough not to scare wildlife away, electric boats are extremely popular.

At present, electric boats are generally used in places where no source pollutants are allowed or where noise or speed restrictions exist. Travel on many lakes that provide drinking water is restricted to electric boats or to other types of boats that do not use fossil fuels, like sailboats. Many harbors and canals restrict speed, and electric boats are very popular in these areas.

Electric boats are excellent for wildlife observation on small rivers, lakes, and swamps because they are almost silent. As people become more concerned for the environment and interested in the world around them, electric boats will again become an accepted means of traveling nature's lakes and streams.

In a family outing to one of their favorite secluded spots on the Black River, the Littles traveled in an electric boat upstream, had time for a swim, and returned home in one afternoon. The same quiet trip would have taken all day by canoe. But not all trips are so short. One Black River Boat set a world record for traveling one hundred miles in twenty-four hours without a recharge.

1889
North Carolina's first electric streetcars begin service in Asheville.

1902
The North Carolina Good Roads Association is organized to promote a network of all-weather roads that will connect every county seat and all state institutions not in a county seat with each other. Harriet Morehead Berry of Hillsborough is instrumental in publicizing the plan and securing legislative support.

1902
The first automobile is registered in Charlotte.

December 17, 1903
Wilbur and Orville Wright accomplish one of humankind's greatest feats by flying the first mechanically powered, controllable, heavier-than-air craft. On the first successful flight, Orville reaches a height of about ten feet for twelve seconds and travels 120 feet in the winds of Kill Devil Hills near Kitty Hawk.

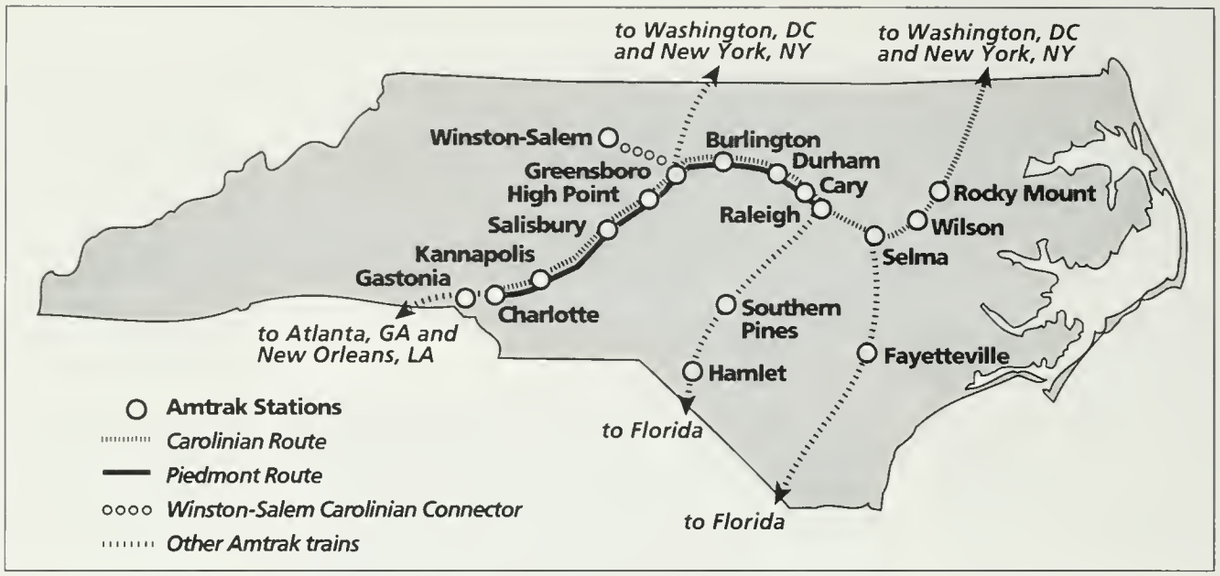
1905
John B. Rumbaugh of Asheville is the first person to drive a car from Asheville to New York City. The trip takes him fourteen days! In 1911, he will become the first to drive across the Appalachian Mountains into Tennessee.

1907
Paul Cornu maintains the first flight of a true helicopter at five feet above ground for twenty seconds.

1908
The Clinchfield Rail Road between Marion, North Carolina, and Erwin,

Douglas Little and his family have been building wooden boats for more than twenty years. They use only dead or fallen trees to hand-craft several models that have to be powered by paddling humans or electric motors. Their Black River Boats shop and proving area are located beside Six Run Creek, a tributary of the Black River, in Sampson County.

All photographs in this article are provided courtesy of the author.



Citizens of North Carolina can boast of several Amtrak routes, like the Carolinian, the Crescent, the Silver Star, and the Silver Meteor, and one state-supported route, the Piedmont. Many of these routes follow the Piedmont Crescent, which grew along the route of the North Carolina Railroad in the 1800s.

North Carolina's rail industry

by Jim Wrinn

North Carolina's railroads have seen many changes since your father or grandfather rode the rails as a youngster.

In the fifty years since the end of World War II (1941–1945), railroads have changed virtually everything about the way they do business. The trains, the workers, even the tracks are significantly different.

Many railroad lines merged to become more efficient. The only major railroad with its headquarters in North Carolina was the Atlantic Coast Line, which merged with its rival, Seaboard Air Line, in 1967 and ultimately became part of a giant East Coast system called CSX in 1980. The Southern Railway and Norfolk & Western merged to become Norfolk Southern in 1982. Today, Norfolk Southern, CSX, and a host of **short lines** make up North Carolina's railroad system.

Engine technology changes the industry

In those fifty years, railroads also began to rely more on technology.

In the 1950s, the railroads in North Carolina switched from coal-burning steam locomotives that required frequent repairs and many people to run them to more efficient

The City of Raleigh is one of the two locomotives used on the Piedmont route. The three-thousand-horsepower engine has a top speed of just over one hundred miles per hour. The one-way, 172-mile trip from Raleigh to Charlotte currently takes an average of three hours and forty-five minutes. But in October 1992, plans were announced to improve tracks, signals, and crossings along a route from Washington, D.C., to Charlotte and reduce travel time from Raleigh to Charlotte to two hours.

Definitions

When a company or service is consolidated, all the smaller competitors are merged into one larger body.

One horsepower is the amount of work one horse can do in one second. According to tradition, a typical horse can move a mass weighing 550 pounds a distance of one foot in one second (550 foot-pounds per second). Now, horsepower is a unit for measuring the power of engines and motors. Steam engines in early vehicles generated roughly eight horsepower. A new car with a four-cylinder engine generates between one hundred and two hundred horsepower, a tractor-trailer rig with a diesel engine tuned for over-the-road, highway use can have about five hundred.

Part of marketing a product or service is convincing a buyer that one set of goods is more inexpensive, appropriate, or important than any other option. The marketing process involves promoting, advertising, negotiating, and selling your product or service.

Short lines are smaller companies that buy or lease parts of track systems from larger companies. They usually have a lower cost and are more responsive to their clients.

Passenger trains are already a reality in North Carolina. Some day soon, travelers may be able to travel at speeds up to 95 miles per hour. Think how much faster you can get from Raleigh to Charlotte by train than by walking or using some other mode of transportation. In the next century, a 150-mile-per-hour passenger line may develop between Charlotte and Raleigh. How fast will the trip be then?

diesel-electric engines that burn petroleum to run electric motors that power their wheels. These locomotives, which back then packed an amazing 1,500 **horsepower** each, have since been replaced by newer, even more efficient engines of nearly 5,000 horsepower.

Big railroad shops that repaired steam locomotives shut down. North Carolina had three big steam locomotive shops at one time in three different communities: Spencer on the Southern Railway, Rocky Mount on the Atlantic Coast Line, and Hamlet on the Seaboard Air Line. Machines made in Norfolk Southern's Charlotte Roadway shop today do the work dozens of men once did to repair and maintain tracks so trains can run smoothly and safely.

Competition makes an Impact

Construction of new interstate highways and aggressive **marketing** by the growing trucking industry caused the railroads to lose business for many years. Smaller freight customers turned to the truck industry. Passengers turned to faster airlines and private automobiles.

Railroad companies responded to the trucking industry with larger freight cars. Some carry more than 120 tons of cargo each (trucks can carry only about 30 tons on most roads). Companies created unit trains that haul one single commodity such as coal or grain in trains stretching almost one hundred cars long. And they entered competition with the trucking industry by placing truck trailers "piggyback" on top of flatbed railcars. Today, railroads are hauling more and more freight.

Passenger trains, though, became fewer, and in 1971 the United States government assumed control of most passenger trains with Amtrak, a **consolidated,** nationalized rail passenger system. The Southern Railway, which served much of North Carolina, operated its last passenger train, the famous Southern Crescent, until 1979 when Amtrak took over the route. Today, the North Carolina Department of Transportation is reintroducing passenger trains, such as the Carolinian and Piedmont, as highways and airports become more and more congested.

Many people think rail travel is coming back in style. Plans are being made to run passenger trains between Charlotte and Raleigh at speeds up to 95 miles per hour. Travel time will shrink to two hours by the year 2000. In the next century, a 150-mile-per-hour passenger line may develop between Charlotte and Raleigh. That will cut travel time again and mark another big change on North Carolina's railroads.

Tennessee, is completed. With some of the steepest and curviest sections of track in the eastern United States, it is considered one of the greatest engineering feats since the Saluda Grade in 1878.

1912
Coy Richardson, a farmer and mechanic in Alleghany County, produces a vehicle capable of navigating his muddy fields near Sparta.

July 4, 1912
Fourth of July festivities in Gastonia feature an "aeorplane" [*sic*]. Three thousand people crowd onto a new electric railway line between Charlotte and Gastonia to see it, while 110 automobiles carry other observers to the celebration.

1914
The new Mount Mitchell Railroad opens North Carolina's secluded Black Mountains to logging and tourism.

1919
Dillon Supply Company builds a self-propelled mechanical cotton picker for Loomis MacGoodwin of Raleigh. It is one of the first field machines to pose a serious threat to human labor.

1921
Intensive lobbying by Harriet Morehead Berry leads to passage of a law creating North Carolina's modern state highway system.

1923
Military officials sail to a site off Cape Hatteras for a demonstration of the potential of aerial bombing. General Billy Mitchell supports his argument for increasing the use of airplanes in warfare by destroying two retired navy ships in less than thirty minutes.

1925
Mrs. W. J. Matherly of Chapel Hill invents what is possibly the first automobile

Jim Wrinn has always loved railroads. A graduate of the University of North Carolina at Chapel Hill, Jim currently lives in a 1923 house in Salisbury with two cats and writes for the Charlotte Observer.

Photographs in this article are provided courtesy of the Rail Division of the North Carolina Department of Transportation.

A little aviation technology

Airplanes may not have become a typical mode of family transportation, but some adventurous people do own vehicles that fly. Hang gliders, for example, are especially popular around Grandfather Mountain and near Kill Devil Hills on the Outer Banks. The triangular wings that are popular on many hang gliders, like this one, were invented by Francis Rogallo. The design carries his name, the Rogallo wing, and earned him the title "father" of hang gliding.

Even at this later date, young men and women crowd the fence at the Rocky Mount Municipal Airport to watch. Did you notice the small plane in the center of the lineup?

Lindy's kids

by Tom Parramore

In 1923 Bill Winston, an army pilot from Wendell, gave twenty-year-old Charles "Lindy" Lindbergh his first formal flying lessons.

Four years later, on May 20, 1927, Lindy's little plane took off from New York. After a thirty-three-hour flight, largely over the Atlantic Ocean, he touched down in a field near Paris, France.

Suddenly, everyone was excited about aviation. Lindy's New York-to-Paris flight was a sign that airplanes would change how we live, work, and play. After that day, airplanes no longer seemed a dangerous toy for daring sportsmen or stuntwomen or a deadly weapon of a world war. Many young people, especially, went wild over aviation after Lindy's flight.

Many started by making models . . .

Youngsters who idolized Lindbergh rushed to join model airplane clubs. At age seventeen, Winston-Salem's Thomas Hill won the 1928 National Airplane Model League's top prize—a trip to Europe. A year later, Hertford's Billy Crawford made a model of his father's World War I plane. Billy's big aim in life was to build a truly safe airplane.

At Rocky Mount in 1937, Woodrow Marshall and other Boy Scouts made a replica of the Wright brothers' first plane and took it to Washington, D.C., for the first national Boy Scout Jamboree. On a June night, Marshall "flew" it down a wire on the White House lawn, its outboard motor roaring like the real thing.

. . . then moved on to real aviation

Some built more than models. After winning a national model contest, eighteen-year-old Lawrence McClellan, from Fletcher, was soon building a real plane with money he earned by selling models. Monroe's Worth Whitaker caught the aviation bug after watching a barnstormer. He was soon building models, and in 1929, at age fifteen, became America's youngest licensed airplane mechanic. He was "developing an all-metal plane" and an autogiro that could land and take off vertically.

Kinston's John Parrott began flying at age fourteen in 1929. Three years later, he was the first to fly a plane from Manteo to Murphy and back, the length of the state, in one day.

In 1931, Hendersonville's Oscar Meyers, eighteen, who had "no instruction in flying," became dissatisfied with the first plane he built. He fashioned another craft using an old Chevrolet engine and motorcycle wheels. It flew seventy miles per hour.

Unfortunately, not all was fun and excitement. Flying remained risky. At Swannanoa in 1931, Brian Sanborn, seventeen, and his sister Evelyn, fifteen, built their own plane and taught themselves to fly. In the next few months they made 250 flights. They died a year later in the crash of a commercial plane they were flying.

Other young women of the day did not let young men hog all the glory. Louise Derby, of Fayetteville, was sixteen years old in 1933 when she became a licensed pilot. And in 1940, Raleigh's Myrtle Thompson, age fourteen, became the state's youngest aviator and among the youngest in the world.

Without a doubt, the adventures of these young women and men helped rouse their elders to the new and ever-changing wonders of flight.

At least one kid had discovered aviation before Charles Lindbergh's famous flight. Almost three decades earlier, in 1900, Tom Tate of Kitty Hawk was the second person (a year before Orville) to fly a Wright brothers glider—at age eleven.

seat belt and child-restraint device. She places broad bands of cloth under her eleven-month-old daughter's arms and across her chest. Then she adjusts the bands so they are tight enough to hold the child captive yet loose enough for her to move her head and limbs.

1927
The Ford Motor Company manufactures 100,000 cars at a plant in Charlotte.

1927
Charles Lindbergh wins a prize of $25,000 for flying nonstop from New York to Paris, a thirty-three-hour flight over water. He returns to the United States by ship and is welcomed by four million people and a ticker-tape parade in New York City.

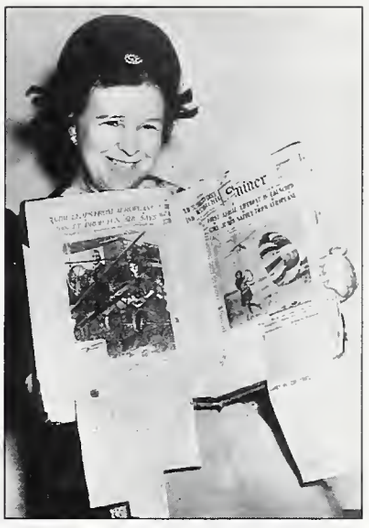
Definitions

Following World War I, many pilots became ***barnstormers****. These aviators flew anytime, anywhere, and anyone or anything. Though they charged $2 to $25 for a ride or delivery, they often flew from cow pastures or fields and slept in barns. Charles Lindbergh barnstormed for a while in the early 1920s when he got lost in Mississippi and damaged his propeller landing in a rough field. He repaid local residents who helped him with repairs by taking them on rides. He ended up staying for two weeks flying stunts and giving joyrides.*

A pipe dream is an illusion or a fantastic plan or hope.

Piedmont Airlines began operating from Winston-Salem in 1940.

In 1908 near Henderson, fifteen-year-old Georgia "Tiny" Broadwick joined a carnival to supplement her cotton mill income. She performed stunts. What was her stunt? She jumped to the ground using an "airplane life preserver." She was a pioneer in parachuting. In fact, in 1913 she was the first woman to parachute from an airplane and the first person to parachute into water from a seaplane. After jumping at air shows across the United States and demonstrating the parachute for the air forces, she retired in 1929. Broadwick is shown here much later with a scrapbook.



Whatever happened to that family airplane?

by Tom Parramore

"The day is coming when flying machines, one-seaters, two-seaters, family affairs and busses, will be as thick over the average town as automobiles on the streets today. Everybody will fly."

That was the bright hope for aviation when the *Kinston Free Press* editor wrote those words in 1927, nearly seventy years ago. In the early years of flight, airplanes seemed likely to replace automobiles. Cars broke down often. They were smoky and noisy. They too frequently frightened horses, with which they shared the road. In addition, roads were muddy in bad weather and dusty in good weather.

In Wilmington in 1909, six years after the Wright brothers' Kitty Hawk flights, watchmaker David Palmgren built an airplane with folding wings. The wings were tucked away for road driving and unfolded for flying. At Durham a year later, James Umstead planned an "aero-auto" that used roads when winds were dangerous. Its wings were also unfolded for flying "when the roads are bad." Who needed mere cars at all? Airplanes, many thought, could be small and light, use little gasoline, and take off and land in spaces hardly bigger than backyards.

Warrenton's William Christmas in 1910 patented a biplane that balanced automatically in rough weather. "The harder the wind blows," his ad said, "the . . . more stable it becomes, thus eliminating the danger . . . in windy weather."

That same year, W. F. Johnson, a Greensboro African American, designed an electric plane that would "be absolutely safe from . . . turning over in the air or falling."

Raleigh car dealer Carr Booker in 1920 built a "Baby Aeroplane" to sell for $1,200 to $1,500, the cost of a medium-sized car at the time. This aircraft had a twenty-foot wingspan that allowed it to land on a flat roof or on a road. It flew twenty miles on a gallon of gasoline. Four years later, in Greensboro, Charles Meyers built "Midget" biplanes even smaller—sixteen feet from wingtip to wingtip, thirteen feet long.

Also in Greensboro but three years later, in 1927, Edward Simmington, a cigar maker, built a plane and filled its light metal wings and body with helium to prevent tailspins and dives. Heated pipes kept ice from forming on the craft's wings.

Even after World War II ended in 1945, the Kinston editor's dream was still alive. In 1959, Igor Benson of Raleigh began building tiny "gyrocopters." These were single-seat aircraft weighing as little as 250 pounds. Gyrocopters could rise straight up, buzz over to Winston-Salem—one hundred miles—in ninety minutes, and land on a tennis court.

Sadly, few families today have their own airplanes. Today's planes use lots of gasoline, are expensive to buy and own, and need long runways to take off and land. What happened to the shining promise of family planes?

Some say it was war. Airplanes had barely begun developing before World War I started in Europe in 1914. Suddenly, governments wanted high-speed planes that could carry bombs or other heavy loads. Safety and gas mileage were swapped for powerful engines. Then came more wars and a demand for even greater speed and more power.

Unfortunately, the Kinston editor's dream was largely just that. For most of us, family airplanes are still a pipe dream.

Many people own ultralight aircraft. Ultralights weigh less than 254 pounds, carry less than five gallons of fuel, have only one seat, and fly slower than sixty-three miles per hour. Ultralights are one way modern-day pilots can return to the pioneer spirit of early flight: some of the materials and designs are experimental, the craft move slowly and stay close to the ground, and many pilots are exposed to the weather. Some ultralights are also called homebuilts, since they are made from scratch or from kits at the builder's home. The Benson gyrocopter is one of those kits. It was developed by Igor Benson in North Carolina in 1959. Unlike on a helicopter, the top rotor is not powered but spins freely to provide lift as the craft moves forward. The rear engine and propeller provide forward motion. The gyrocopter has a sea level cruising speed of sixty miles per hour, although it has set a speed record of seventy-nine.

1931
Raleigh becomes a rest and refueling stop on the first regularly scheduled airline passenger route from New York to Miami.

1935
German engineers begin developing early prototypes of jet engines. A poor decision by Adolf Hitler slows Germany's introduction of jet aircraft into World War II until after 1944.

1936
The Intracoastal Waterway is completed through North Carolina.

Tom Parramore has written three textbooks for eighth graders on North Carolina history. He rarely thinks about anything except aviation and is currently chairing the history committee of the First Flight Centennial Commission, which is preparing to celebrate the one hundredth anniversary of controlled, powered flight by the Wright brothers, in 2003.

Tom Tate with his fish is provided courtesy of the author. The hang gliding photograph is provided courtesy of the Travel and Tourism Division of the North Carolina Department of Commerce. Rocky Mount airport, Tiny Broadwick, and the Piedmont airliner (in the sky) are from the North Carolina Division of Archives and History. All other artwork is from the North Carolina Museum of History.

1937
The German airship *Hindenburg* bursts into flames in New Jersey after arriving from Frankfurt, Germany.

1940
Piedmont Aviation is incorporated under North Carolina law. The airline company is headquartered at Smith Reynolds Airport in Winston-Salem.

1944
During World War II, Major George E. Preddy of Greensboro gains international fame as a flying ace by shooting down a record number of Nazi aircraft.

1948
North Carolinian Francis Melvin Rogallo invents the triangular-winged delta plane for hang gliding.

1949
The General Assembly authorizes $7,500,000 in bonds to improve the shipping ports at Wilmington and Morehead City.

1949–1953
More than 14,800 miles of rural roads are finally paved in Governor W. Kerr Scott's campaign to "get the farmer out of the mud."

1950–1953
While they were first used in World War II (1941–1945), helicopters become indispensable during the Korean War. When medics begin serving on helicopter crews and giving blood transfusions in flight, the number of wounded soldiers who die before reaching hospitals drops in half.

1954–1958
The Boeing 707 (1954) and the McDonnell Douglas DC-8 (1955) are introduced to the public. Together, these two planes change the world's travel mode from ships and trains to airplanes. By 1958, more than one million passengers fly across the Atlantic Ocean—the first time more people fly across than cross on steamships.

1962
Clarence "Kelly" Johnson unveils the SR-71 Blackbird,

Definitions

*A statistic has **peaked** when it reaches its highest level.*

*In this case, **utilities** are companies that produce and sell power.*

Electric vehicles—their history and their future

by Tim Shawver

In 1903, Gilbert S. Waters was trying to change businesses. He had been making horse-drawn carriages. What he wanted to do was make horse-"less" carriages. The result of an attempt was this gasoline-powered buggymobile, which he built at his shop in New Bern. Gasoline power was only one of the major competitors for powering automobiles of this time. Steam power was also in use and in fact was the most popular choice.

Electric vehicles are not new ideas, and in the early days of horseless carriages, electric cars were a preferred choice of those who could afford motor vehicles. The first electric vehicle was built 160 years ago, in 1836, by Thomas Davenport in Scotland. By 1900, 38 percent of the 4,200 cars sold in the United States were electric. The remainder were steam-powered "steamers," then the most popular form of automotive transportation (40 percent), or had gasoline-powered internal combustion engines (22 percent).

The Detroit Electric Company was the last American company to manufacture early electric cars commercially. Their production peaked between 1912 and 1920, when sales reached about 1,000 cars per year.

Why were electric vehicles so popular?

"Freedom of odors" was a major selling point for Detroit Electric cars. In those days, vehicle odors were caused by exhaust from gasoline-powered vehicles, smoke from steam engine fires, and fumes from horses!

Electric vehicles were the choice of most women drivers of the day, including Henry Ford's wife, Clara. Miss May Ellinwood of Davidson drove long before cars, let alone women drivers, were common. In 1912, Mrs. Ashley Baker shocked residents of Durham when she paid $3,500 for a forty-two-unit battery-driven automobile capable of going sixty miles on one charge.

Electrics were popular among women because women wore long, heavy dresses at the time. Electrics had few pedals and controls for these dresses to get tangled with. They also had beautiful interiors, since many of them were still handcrafted by buggy and carriage manufacturers.

But at the time, men usually paid the money that bought cars. And men preferred more durable, powerful, and longer-ranged gasoline-powered vehicles.

Other factors doomed their fate as well.

What happened to electrics?

The early automobile industry was indecisive about which power source—electricity, steam, or gasoline—to promote.

Without a question, electric vehicles were quiet, clean running, and easy to operate. But they were also limited to between forty and sixty miles between charges (the actual distance depended on how fast a car was driven and how hilly the terrain was), and charging stations were scarce in North Carolina.

Within little more than ten years, technology and the public's thirst for speed and power sealed America's transportation future behind the wheels of gasoline-powered automobiles.

Ironically, the introduction of an electrically operated starter in 1911 helped finalize the gasoline engine's future. Electric starters eliminated the strong and sometimes persistent hand-cranking that was often needed to start an engine.

When Henry Ford's genius for mass production took over in automobile factories, such gasoline cars as his Model T became widely available and more affordable than the competition.

As the American love affair with the open road bloomed, the range, convenience, and power of the gasoline-powered vehicle left its transportation rivals in the dust.

Could electrics save the day?

Now, however, in this century's final decade, as concerns about the environment and energy use become more apparent, electric vehicles are on the edge of reappearing. After false starts at reviving electric vehicles in the 1970s, American automakers seem committed to bringing practical and economical electric vehicles into commercial production by the late 1990s.

Electric vehicles exhaust no source emissions, or tailpipe pollution. For every mile traveled in an electric vehicle instead of a gasoline vehicle, emissions such as carbon monoxide, volatile organic compounds, nitrogen oxides, and carbon dioxide drop significantly. Electricity can be generated by a number of power sources and is not reliant on any one kind of fuel.

Besides decreasing air pollution, this modern electric vehicle could reduce our dependence on foreign oil supplies. If we used less oil, we would not have to import as much. The United States would then be less vulnerable to price increases and supply shortages caused by foreign influences.

Duke Power Company currently owns and operates this restored 1918 car made by the Detroit Electric Company. It is a good example of just how basic electric vehicle technology can be. Electric vehicles have only four components. A battery pack, or battery bank, stores the fuel that powers the car. A control system regulates the amount of electricity that flows from the battery pack to the motor. And a motor changes electrical energy to mechanical energy to move the vehicle. The fourth component is a power source (like photovoltaics, or solar cells) or a charging unit (like a plug into a recharger).

North Carolina's Duke Power Company is one of a few electric **utilities** across the country researching improvements in modern electric vehicle technology. Researchers there are currently working with the city of Charlotte to introduce an electric shuttle bus system. And in Charlotte, the utility is planning to provide fifty spaces in the parking deck of the new Panthers football stadium that will be "EV (Electric Vehicle) Ready."

North Carolina is also taking a part in the manufacturing of electric vehicles. Thomas Built Buses, of High Point, for example, is developing an electric school bus. This technology will be in use by the end of 1996. In addition, one of the cars in Duke Power Company's electric vehicle fleet was converted to electric power by a manufacturer in Monroe.

Electric vehicles are indeed coming back again—reinvented with today's technology. So, sooner than you think, you or someone you know may be quietly and quickly zooming down the road in an electric vehicle, helping to save money, resources, and our environment.

which is capable of reaching Mach 3.3 (3.3 times as fast as the speed of sound) at 90,000 feet. Among its speed records is a flight from Los Angeles to Washington, D.C.—in about one hour!

1970
The Boeing 747 enters service with seating for up to 550 passengers. New wing designs and construction materials are pioneered for this aircraft, which takes an acre of space just to park in.

1979
Van Morgan, a high school senior from West Forsyth, is recognized by the Westinghouse Science Talent Search for inventing a car safety device he calls "USCAN," an "ultrasonic collision anticipator." Morgan's device emits silent sound waves from a box mounted on a car's front bumper. The waves bounce back from the rear bumper of a similarly equipped car ahead. The distance between bumpers is measured by a computer. The computer also calculates the speeds of both cars, the driver's reaction time, and any effects of weather conditions before warning the driver if he is following too closely.

Tim Shawver is currently manager of the Electric Vehicle Program at Duke Power Company in Charlotte. He has a background as an environmentalist with a mix of technology and a dream to clean up our environment.

The buggymobile photograph is from the North Carolina Division of Archives and History. All other photos are provided courtesy of the author.

For more than two hundred years the speed of communication in North Carolina has increased steadily. In the middle and late 1800s, a Western Union telegram office, which every town had, was the center of communication technology. After all, sending a telegraph was quicker and more reliable than the other options of the time, pony express or mail by train. But then the telegraph gave way to the telephone; cameras came and were joined by moving pictures, or movies on film; the record player and tape recorder appeared; and the radio, television, computer, and compact disc player burst on the scene. Today, sending a telegram is probably one of the last methods we think of for contacting someone. In fact, now more than ever before, schools and companies in North Carolina depend on keeping up with advances in communication technologies. Some Tar Heel organizations are among the world's leaders in shaping the direction of those technologies for tomorrow.

From packet ships to glass cables: Technology and communication

by Jim Mulholland

Cellular telephones, fax machines, E-mail, the Internet. These terms are the vocabulary words of modern telecommunications. The ability to exchange thoughts, opinions, and information with individuals across the street or around the world almost instantly seems so ordinary to us.

But even to our parents, and especially to our grandparents, how awesome, how new does the modern world of communication technology appear. Believe it or not, communication was once a slow process.

In 1771, North Carolina Governor William Tryon wrote to his superiors in London to express his concerns over the Regulation movement. His letter, probably carried on a speedy **packet ship,** may have taken just over six weeks to reach England. The response back across the Atlantic Ocean took another eight weeks. Even to communicate between two towns inside the colony, between Edenton and Charlotte, for example, could take weeks, since no regular "mail" or delivery service was yet established.

About one hundred years later, after the Civil War, railroads crisscrossed the state. And where railroads went, telegraph lines soon followed. All but the most remote mountain hollows or eastern marshlands were quickly connected by telegraph wires.

Still, even by the beginning of the 1900s, few people had access to quick communication. Telegraph lines seldom entered homes and few yet had telephones. Written communication continued to bring the world to North Carolinians.

In the early 1920s, WBT in Charlotte and WPTF in Raleigh became two of the first commercial radio stations licensed to broadcast in the United States. At the time, over half of the homes in North Carolina still did not have electricity to operate radios. Television arrived in the Tar Heel State in 1949, when WBTV in Charlotte and WFMY in Greensboro began transmitting. WUNC in Chapel Hill became one of the first public television stations in the country in 1955.

By 1971, two hundred years after Governor Tryon's slow correspondence, 20 television stations and 238 radio stations were carrying news, sports, and entertainment to North Carolina homes.

At the center of the most recent progress in communications is computer technology. Companies in North Carolina research and manufacture computer models ranging from networked workstations to individual laptops and "notebooks." Special materials and components are developed in universities and research laboratories across the state to increase computer speed and memory and provide greater flexibility.

Fiber optics, glass cables capable of carrying far more data than metal wires, are also being manufactured in North Carolina to improve future communication on the **information highway.**

Definitions

The ***information highway*** *is a computerized data-sharing system that now spans the globe using electronics, not vehicles. The World Wide Web, the Internet, electronic mail, videoconferencing capabilities, and electronic commerce are all parts of the information highway.*

A ***packet ship*** *was a fast-sailing ship, often chartered by a government, that carried mail, cargo, and passengers on regularly scheduled trips.*

Jim Mulholland is currently associate professor of history at North Carolina State University in Raleigh where he teaches the history of science and technology. His Ph.D., in the history of science and technology, is from the University of Delaware.

The photograph in this article is from the North Carolina Division of Archives and History.

Reaching across the airwaves: Early North Carolina radio

by Pamela Grundy

Before the 1920s, the world seemed very small to many North Carolinians. Most residents lived on farms or in small towns and rarely traveled far from home. Their lives centered around the activities of family and neighbors.

But in 1922 this began to change. North Carolina's first commercial radio station, Charlotte's WBT, went on the air in April. By the mid-1930s, "wireless broadcast" was a major source of entertainment for people throughout the state. If North Carolinians did not go to the world, it would come to them.

The power of broadcast technology

Radio technology began to develop in the 1890s and was first used for ship-to-shore and ship-to-ship communications. Some of the earliest experiments in radio communication were conducted on the Outer Banks by radio pioneer Reginald Fessenden.

The general public got its first taste of radio broadcasting in 1921. That year, the United States Department of Commerce issued its first "broadcast" license to station KDKA in Pittsburgh. By the end of 1922, more than six hundred stations, including WBT, had been granted licenses. Radios were sold as fast as they could be made.

Not everyone in North Carolina rushed out to buy one. Much of the state's population had no money for that kind of "extra." Most farms did not even have electricity.

About the same time that Orville and Wilbur Wright were experimenting on the Outer Banks with their gliders and flyers (1900–1905), Reginald Aubrey Fessenden, a colleague of Thomas Edison, was conducting some of the earliest "wireless telegraphy" experiments nearby. In 1920, the nation's second experimental station, 4XD, began broadcasting from Charlotte. Two years later, the station turned commercial as WBT.

But North Carolinians did not have to *own* radios to enjoy the new technology. Many people listened in groups at the homes of neighbors. Some visited businesses where owners had learned that radio sets attracted potential customers. When WBT broadcast

Hiram and Ezry play "hillbilly" music in the studio at WPTF in 1929.

the 1928 Cardinals *v.* Yankees World Series, Charlotte listeners gathered at drugstores, barber shops, a car dealership, a furniture store, and at least two funeral homes to listen.

Early stations broadcast sports events, lectures, church services, farm market reports, and plenty of live music. After 1926, when the National Broadcasting Company (NBC) was formed in New York, many of these broadcasts **originated** outside North Carolina.

NBC produced programs that were broadcast through a **network** of stations around the country. NBC's success soon led to the founding of the Columbia Broadcasting System (CBS). Programs from both radio networks included comedy shows, soap operas, mystery theaters, action stories, dramas, and westerns. They exposed North Carolinians to events and talents from across the United States and around the world.

Many of North Carolina's most popular programs, however, featured Tar Heel

North Carolina communication: A chronology of invention and technology

1749
In New Bern, James Davis begins operating the first printing press in North Carolina. By 1751 he will publish the first newspaper in the colony, the *North Carolina Gazette.*

1816
North Carolina's oldest continuous newspaper begins publication in Fayetteville as a weekly. The *Fayetteville Observer* will become a daily in 1896.

1821
Sequoyah completes work on the Cherokee alphabet. He has devised more than eighty symbols to represent the sounds and syllables of a language that cannot be expressed in English. The Cherokee become the only Native Americans with a written language.

1850–1851
Wilmington's *Daily Journal* and the *Raleigh Register* are North Carolina's first daily newspapers.

1867
Christopher Latham Sholes begins work on the first practical typewriter, and by 1874 the Remington gun company will start manufacturing a modification of his "literary piano." Of 25,000 machines made, only 1,200 will be sold—the machines are very expensive, very heavy, and very awkward: typists cannot see what they are typing! In addition, many prominent leaders think the new contraptions promote laziness and will not allow their use in official business.

Definitions

In this case, a network is a series of radio stations linked by wire or radio relay. But remember, too, a network could be the company that produces programs to be broadcast over such a series of stations.

Where a program originates is where it is originally created and broadcast for the first time.

1879
Raleigh and Wilmington open the state's first telephone exchanges.

1880s
Charles Halleck Wing establishes the Good Will Free Library in Ledger, Mitchell County. To overcome the difficulties readers have reaching his library over the rough mountain trails of the time, Wing places small collections of books at convenient locations throughout the region. These collections are rotated at regular intervals, a foresighted suggestion of today's bookmobile plan.

1880
George S. Sergeant installs the first two telephones in Greensboro, one in his home and one in his office, about one-third of a mile apart.

1890
Even though the United States Weather Bureau is created this year and begins scientific forecasting, North Carolina farmers continue to predict the weather as they always have—by folk beliefs like "The winter will be severe if squirrels grow bushy tails"; "When a cat washes its paws, rain will soon follow"; and old-time rhymes like "Onion's skin thick and tough, coming winter cold and rough."

1901–1906
Reginald Aubrey Fessenden, once an assistant tester at Thomas Edison's laboratory in New York and chief electrician at Westinghouse, experiments with wireless telegraphy near Manteo. Continuing the research started by German physicist Heinrich Rudolph Hertz and Italian inventor

Pamela Grundy is a student of the South's popular culture and a big fan of hillbilly music. She is currently writing her dissertation on the history of basketball in North Carolina. She recently published an article on the history of WBT in Southern Cultures.

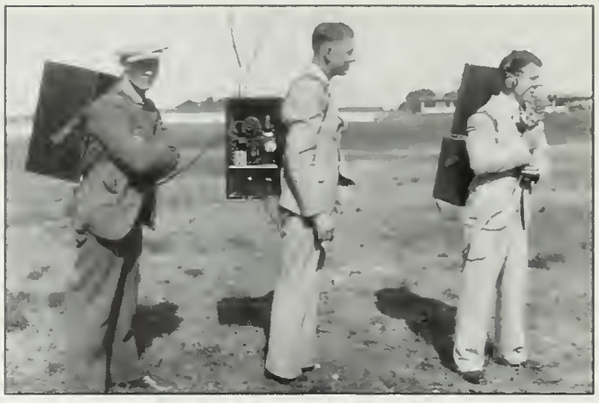
The photograph of radios from the past is from the North Carolina Museum of History. All other photographs in this article are from the North Carolina Division of Archives and History.

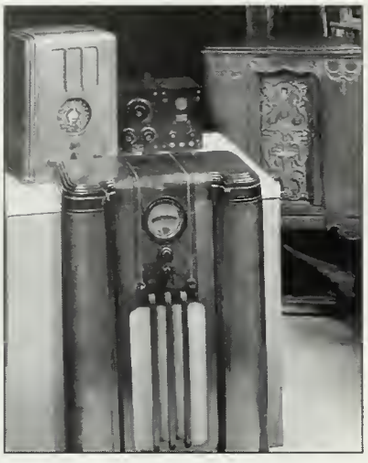
performers. Radio had a major effect on the state's musical traditions. Radio broadcasts gave North Carolina musicians many new sounds to listen to. Swing bands and classical orchestras, for example, introduced performers to smoother sounds and more intricate arrangements.

North Carolina's own musicians also used radio to spread their talents. In fact, radio exposure allowed some bands to pursue full-time professional careers. Early stations did not play many records, so they were always looking for good live performers.

"Hillbilly" music, the roots of today's country music, became one of North Carolina's most popular radio sounds. Bluegrass legend Bill Monroe had one of his first radio jobs on WBT. Other popular performers included Hickory's Bill and Earl Bolick, known as the Blue Sky Boys, Raleigh's Tobacco Tags, and Buncombe County's J. E. and Wade Mainer of Mainers' Mountaineers. The first North Carolina music programs to achieve national network broadcast featured hillbilly performers.

African American gospel groups also hit the airwaves. The Golden Gate Quartet broadcast gospel songs from WBT. And groups such as the Heavenly Gospel Singers and the Selah Jubilee Singers were regulars on Raleigh's WPTF.





By the 1930s, radio was a major source of entertainment for North Carolinians, and the technology continued to expand. In 1930, WPTF had a mobile broadcasting unit (below). In 1932, the station was testing an early remote unit at the state fairgrounds (left). Throughout the period, many different receivers were becoming available (below, left).

The other side of the coin

Still, radio fame came only to performers whose programs caused no controversy. Sponsors and stations worried about offending listeners. So they broadcast only music they thought listeners would consider "respectable."

Decisions about respectable music often affected North Carolina's African American performers, especially jazz and blues musicians. In the 1920s, for example, many people associated jazz with drinking and wild dancing, and stations often avoided it. Durham was home to some of the nation's greatest blues musicians, including Sonny Terry and Blind Boy Fuller. But blues music was not considered respectable, and blues performers rarely got on the radio. Many years would pass before the state's African Americans could hear their favorite nongospel music on the radio.

Even with these limits, however, listeners had plenty to hear. By the mid-1930s, radio had become a significant part of many people's daily lives.

"Saturday morning, you'd go uptown on the trolley," explained textile worker Everett Padgett. "Go uptown on the trolley and buy you a little stuff and come back. Saturday evening, go watch the ball game. Saturday night, listen to the radio. There wasn't nothing else doing."

From town crier to TV: Television and technology

by Fred Gent

"Full throttle and pull up!" The DC-9's engines roared to life. The jet passed over people watching jets land from an observation area near the runway. But the wind shear was too strong. Only yards from the runway the DC-9 hit the tops of trees, slammed to the ground, and skidded a thousand yards into a house. The plane burst into flames. Storm clouds were so dark and the rain so thick that air traffic controllers at the airport did not see what happened.

But one of the people in the observation area did. Using her cellular phone, a woman called 911 to report the crash. Then she called WBTV News. She said a big jet had crashed at the airport.

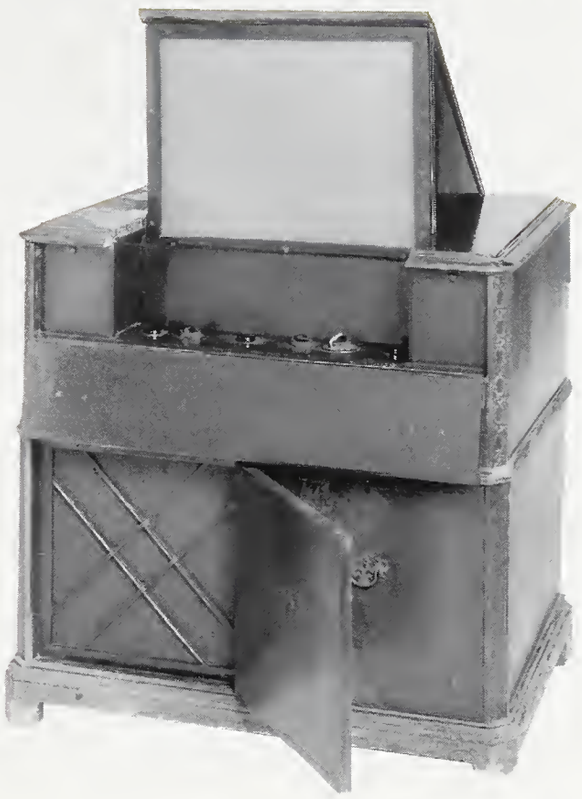
"But we haven't heard anything on the police radio," the news assignment editor said.

"You will," the caller replied.

That happened at 6:43 P.M.

Within minutes, television viewers heard: "We interrupt regular programming with this special bulletin." In less than twenty minutes, WBTV News was broadcasting a live picture of Charlotte's worst disaster of the year.

About fifteen minutes later, WBTV News went on the air with live pictures of the crash site from the station's helicopter. Viewers could see the path of the jet where it hit the ground. They could see broken and flattened trees leading to its tail section and a crumpled nose section lying beside a house. They



Early television sets had black-and-white pictures and received only a few channels. Of course, stations did not broadcast in color, and only a few channels were broadcasting. A 1946 RCA television (below, left) was equipped with an optional oil-filled magnifier to make the picture appear larger. Just two years later, this 1948 RCA model (above) came in a decorative cabinet that opened at the top to reveal a projected screen.

watched a massive rescue effort as helicopters from Charlotte hospitals landed to whisk the injured away.

A Red Cross representative came to the television station to ask WBTV News to broadcast a plea for blood donations. Within two hours hundreds of people were in line at Carolinas Medical Center patiently waiting to give blood for survivors of the accident.

Before long, viewers across the country were watching the live coverage, too. Soon, they, too, knew that twenty people had survived the accident. And they knew that thirty-seven passengers had died.

The speed of broadcast technology

Not too many years ago, broadcasting these events would have taken several hours (see the sidebar on page 35). Not long before that, only a radio story would have covered the accident.

But on that night less than two years ago, WBTV News used every type of

Definitions

To abort a landing is to decide against it and change directions at the last moment.

*The **Doppler radar** works by sending continuous radio signals into the atmosphere. The signals travel at a special frequency that detects moving objects, even as thin as clouds and rain. The objects reflect the signals back to the radar device, which translates them into an electronic image.*

*A **live link** is a connection between the transmitter and the receiver at the station. A **feed** is a taped image that is sent on a live link.*

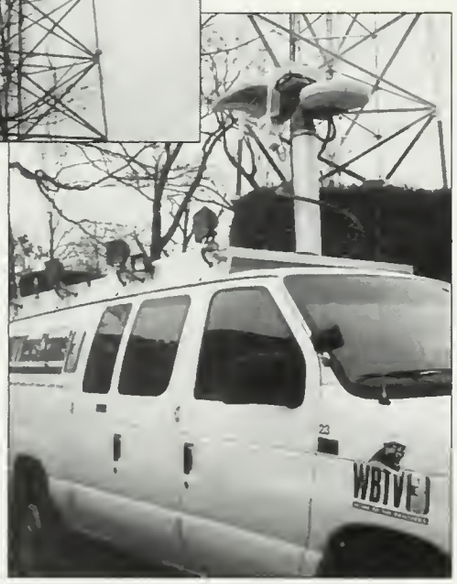
*WBTV broadcast the first **microwave** signal in Charlotte. A microwave is able to transmit electronic signals of light and sound from one place to another through the air without a cable.*

*The first **satellite** was rocketed into space by the Soviet Union in 1957. Since then, hundreds of them have been sent into orbit around earth. Many stations have satellite **uplinks** that allow them to broadcast video pictures and sound to a satellite in space. Every television station and many homes have satellite receivers.*

Videotape cameras were invented in the 1950s but were first used in local news operations in the 1970s. They are small, weighing only thirteen pounds, and extremely sophisticated. They are able to transform and record light and sound electronically onto a one-half-inch-wide cassette tape.

Wind shears are strong and sudden changes in wind speed and direction. They are largely unpredictable, and pilots often do not have any time to respond successfully. Following the USAir crash in Charlotte, research on a new and more sophisticated radar system that could better predict wind shears was finished. The system was installed late last year.

Special receivers on the station's antenna below, top, receive microwave signals that are transmitted from a mobile truck's microwave transmitter (bottom).



What had happened?

by Fred Gent

Saturday, July 2, 1994, was the beginning of the Fourth of July weekend. Across the country, millions of people were flying to vacation spots or to visit relatives. Fifty-seven of them were aboard USAir Flight 1016 arriving in Charlotte from Columbia, South Carolina.

At WBTV News, the weekend crew had just completed their six o'clock broadcast. The meteorologist had forecast "popcorn" thunderstorms for the rest of the evening. Popcorn storms are relatively small but severe thunderstorms that form suddenly, develop intense rainfall and high winds, then just as suddenly disappear—typical summer weather for the Piedmont in North Carolina.

Air traffic controllers at Charlotte-Douglas Airport began warning pilots on the ground and in the air about an approaching storm they were following on their Doppler radar. Other sophisticated instruments picked up something more sinister about this storm. Inside it were sudden and strong shifts of wind called **wind shears**. Wind shears are so strong and so sudden that they can cause a powerful jet to crash in seconds.

Flight 1016 had been cleared to land. At an altitude of 550 feet and a distance of less than a mile from the runway, rain began pelting the jet. Winds increased. The pilots decided to **abort** the landing and fly around until the storm passed. As they turned the jet, they realized that the wind direction had suddenly reversed and was pushing the jet down. They were in the middle of a treacherous wind shear. The captain ordered an increase in speed. "Full throttle and pull up!"

communication technology available to broadcast events surrounding the crash.

Following notification about the crash from the cellular phone call, the station's assignment editor sent two photographers and two reporters to the scene.

Meanwhile, the producer began calling other news personnel for help. The photographers arrived at the crash site before many emergency vehicles. Being careful not to get in the way of rescue personnel, one of them began recording the scene with his **video camera**. This tape would be **microwaved** to the station later as a **feed**.

The other photographer set up a **live link** between the truck transmitter and the station's receiver. With another camera outside the truck, one of the reporters then began interviewing witnesses in front of this live camera. These images were broadcast as soon as the station received the microwave signals and could rebroadcast them to viewers—in only seconds. The tape the other photographer had recorded was microwaved back to the station on the live link when it was not in use. These taped images were broadcast as soon as the station needed them.

The station's helicopter pilot was called in and received permission to fly over the crash site. He turned on his microwave transmitter and, with a special camera and a device that makes sure the helicopter's microwave signal always points to its receiver, began to beam live pictures back to the station for broadcast.

The station's senior meteorologist arrived. His equipment had recorded **Doppler radar** pictures of the storm's path across the airport. As he broadcast them, he explained for viewers what this information meant.

The station's management decided to allow the coverage to "go up on **satellite**" for network stations across the country to pick up. WBTV's broadcast of the crash was assigned a certain frequency on a certain satellite. Stations around the country could tune their satellite receivers to that frequency and watch and record or broadcast the story.

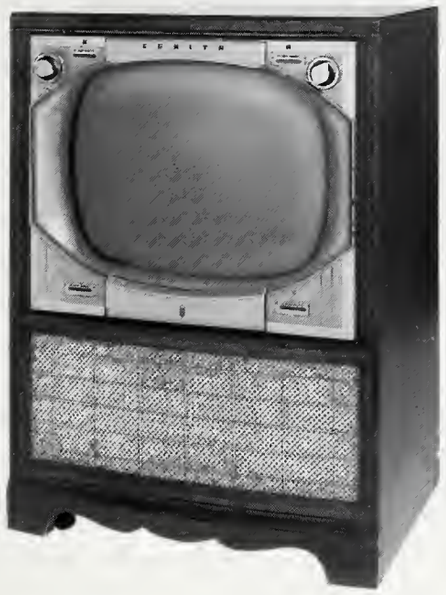
The power of broadcast technology

Television technology is very powerful. With the technological tools mentioned in this

Guglielmo Marconi, Fessenden will successfully broadcast musical notes and speech to launch a new era in communication.

[illegible] 11, 1909
The first known American SOS distress message is received by wireless radio off the coast of Cape Hatteras. It was sent by the freight and passenger liner *Arapahoe*.

[illegible]
At the end of World War I, eight out of every ten German soldiers carry "enemy" propaganda in their pockets. These twenty-seven million



As technology advanced in broadcasting, so did televisions themselves. In 1956, Zenith offered a remote control "gun" (above, top) with its Flash-Matic model (above). The next year, Philco offered a futuristic-looking Prodictor model (right).

article, North Carolina viewers can watch events unfold, live as they happen, right in their living rooms.

Viewers can see presidential candidates debate. They can see the latest position of a hurricane that is threatening our coast. The television screen can be a window to the world, even the universe.

But along with the benefits of receiving information instantaneously come more difficult decisions. Photographers, reporters, editors, and producers of television news must now make quick decisions on what to air, how to air, and when to air. Decisions come down to human judgment—just as they did when the old-time town crier decided what news to shout in the morning.

Covering this crash in the "old days"

by Fred Gent

Covering this accident a few years ago would have been a different "story." After someone called the television station—remember, the lady who first saw the crash would have had to drive from the observation area to find a pay phone to make the call—news personnel would have been dispatched to the scene with tape recorders and film or 35-millimeter cameras.

A news anchor could have interrupted regular programming to tell of the crash but would have had no pictures of the scene.

Photographers would have taken pictures with film cameras, not video recorders. Their film would then have had to be driven back to the station to be developed before it could be broadcast.

To file a "live" report, reporters would have interviewed witnesses and experts, then called the television station over a telephone line. This phone conversation could have been transmitted live or recorded at the station for later or repeat broadcasts.

People beyond the Charlotte area would not have seen pictures of the crash for hours. Duplicate copies of the station's original film would have had to be developed and then driven to other local stations or sent by plane to New York, where a network could broadcast it to affiliates around the country.

pamphlets were delivered by small, self-deflating, gas-filled balloons that carried them over German lines. Henry Louis Smith (see 1896), a Greensboro-born physicist, is responsible for devising this system of mass communication.

1922
Actress Ava Gardner is born in Smithfield.

April 10, 1922
Charlotte's WBT is the first commercial broadcast radio station in the state.

1928
Greensboro becomes the first city in North Carolina to have airmail service.

1937
Howard Aiken completes the IBM Mark 7, acclaimed as the most perfect first-generation computer. It measures about eight feet high and about sixteen yards long, contains 480 miles of cables and thousands of vacuum tubes, and weighs more than thirty tons.

1941–1945
Greensboro native Edward R. Murrow covers World War II for radio listeners. Murrow originates his broadcasts from the rooftops of London buildings with the sounds of bombs blasting and air-raid sirens blaring in the background. These on-the-spot, eyewitness accounts become Murrow's trademark and introduce a new brand of broadcasting.

1948
The so-called second generation of computers begins with the invention of transistors.

Fred Gent, an executive producer of WBTV News, says that the Flight 1016 story was one of the most important stories he has covered in his fifteen years of broadcast journalism. Last October, he addressed a Society of Professional Journalists convention. His topic was covering aviation accidents. In his spare time, Gent is pursuing oral histories of World War II navy veterans.

Photographs of vintage television sets are from the North Carolina Museum of History. All other artwork is provided courtesy of the author.

Friday, July 1, 1949
2:00 Noon
"This is WBTV, Charlotte, North Carolina, signing on Channel 3 television from Charlotte, the Queen City of the South." Following this statement of introduction, many people "watch" a test pattern on their screens until 7:00 PM, when programming begins. WBTV is the first commercial broadcast television station in North or South Carolina. WFMY in Greensboro and WRAL in Raleigh will soon follow.

1950
The first photocopier, the Xerox 914, is finally marketed after nearly twelve years of development.

Surf's up!

by Rick Webb

The Net is changing the way people interact around the world by allowing open communication with a click of a mouse. Without leaving your favorite keyboard, you can "tour" the Louvre museum in Paris, "shop" in an international electronic mall, or "talk" with a computer pen pal in a foreign land. You can even use an encyclopedia on the Internet. These on-line encyclopedias are updated continuously and can provide sounds and moving diagrams in addition to words.

You hear it everywhere. People are talking about the Internet (the Net) and the World Wide Web (WWW). Not since the introduction of radio has a new form of communication stirred up such excitement. Most people do not understand the technology, yet the number of Internet users is growing at an unbelievable rate. Suddenly, "**surfing** the 'net" is the hottest thing going.

Access to the Net is free and open to the public. Amazingly, the Internet is not owned by any one person, group, or company. No one is in charge. An estimated thirty million to fifty million people around the globe are users.

What is the Internet?

The Internet is a "network of networks" with three major components, or parts: electronic mail (E-mail), the World Wide Web (commonly called "the Web"), and **File Transfer Protocol (FTP).**

Users access the Internet by dialing into a server using their computer's modem. To be connected to the Net, you must subscribe to an on-line service such as Prodigy, CompuServe, or America Online or use a local or national Internet service provider or a bulletin board system.

How did the Internet start?

The Internet was designed by the United States Department of Defense during the 1960s as a communication system that was resistant to enemy attack. In the 1970s, four universities were connected. Soon, several different sites were connected to the network. With the introduction of low-cost microcomputers, the Net expanded quickly. Soon networks everywhere were talking to one another. Today five million host computers (systems providing direct access) connect the Net and over forty-five thousand networks worldwide.

What services does the Internet provide?

Once on the Net, you can take a computerized tour of the Louvre museum in Paris, order concert tickets, shop in an electronic mall, get a copy of the latest United States Supreme Court decision, or look at the latest sports stories from ESPN.

You can search for information on any topic imaginable or communicate with a computer pen pal in a foreign land. The Internet is full of directories, data files, reports, catalogs, and other resources, and it is growing every day.

Definitions

*When you **download** files, you copy them to your own computer's files so you can retrieve the information again without using the Internet.*

File Transfer Protocols (FTPs) connect thousands of computers at businesses, libraries, schools, government agencies, and homes via telephone, fiber optic, and other high-capacity communication lines.

*A **site** is a location on the Internet.*

Surfing is the term used for browsing through the Internet.

*Information on the Web is arranged in "pages." **Web pages** are screens of related information in a Web site. You enter Web pages by clicking a mouse on an introductory home page. Web pages may include text, graphics, sounds, and video clips. Since all the pages on the Web are linked together, one click can take you to another location thousands of miles away. Home pages act as directories or brochures for companies, organizations, or individuals. They can serve as a front door to a particular "site" on the Web where you can get more in-depth or related information.*

You can **download** files or software from other computers. More than twelve thousand news groups have been created by special interest groups on the Net. Name a cause or organized effort, and you will probably find an advocacy group with a bulletin board. Luckily you do not have to know exactly where to go on the Net to find the information you want. Search tools known as "gophers" do the searching for you. Just type in what you want them to "go for," and they find it for you. It is that simple.

One of the most useful components of Internet is E-mail. You can compose E-mail at your computer and send it to anyone connected to the Internet. You can even attach a word-processing or other document to your message and, with a keystroke, send E-mail to one person or a group of people. The mail arrives in only seconds and allows the receiver of the message to respond immediately—no more telephone messages or the need for repeating data entry.

The World Wide Web

The Web is the fastest growing component of the Internet. Both home and commercial growth of the Internet are attributed to the popularity of the Web. The Web makes the Internet manageable. Using interfacing software and colorful and creative graphics, the Web links independently operated computers together in an easy-to-use format. With a mouse, users can point and click their way through thousands of text documents, photographs, drawings, recordings, and video clips.

What is the future of the Internet?

The Internet and the Web will continue to grow. Just as first telephones, then radios, and later televisions did, the Internet will continue to make the world seem smaller and information more manageable in the days ahead. Expect more secure sales and money transactions in the future and increased use by commerce and business. Videoconferencing (holding conferences, classes, and meetings with people on video screens instead of in person), electronic commerce (trading and buying goods), and publishing will all continue to mature and expand on the Net.

Whether you use it today or not, you are witnessing the early stages of a new communication system that is likely to change your lives. Already, you can use an encyclopedia on the Net to hear the sound of a bluebird. You may find a pen pal or business associate to hold on-line "discussions" with. Someday you may even read issues of this magazine printed on a **Web page**.

April 23, 1951
The Associated Press office in Charlotte establishes the first teletypesetter circuit.

1957
Charles Bishop Kuralt, born in Wilmington, begins writing for CBS. During the next twenty years, Kuralt will introduce a new approach to gathering and reporting television news. Using his gentle humor and soothing voice, he interviews Americans from coast to coast, encouraging them to share their hopes, dreams, and experiences in front of television cameras.

September 5, 1958
A segment of *The Betty Feezor Show* is recorded on magnetic videotape instead of photographic film at WBTV in Charlotte. This color taping is a first for a television show.

1964
Robert Moog patents his voltage-control music synthesizer. A voice synthesizer will follow and will be used to make voices for movie and television aliens and robots.

1980
David Brinkley, a Wilmington native, retires from the *NBC Nightly News* after twenty-four years. He and his co-anchor for most of those years, Chet Huntley, are responsible for establishing the format of television news as we know it.

1982
Two foreign companies, Dutch Philips and Sony, begin marketing a three-year-old invention that will revolutionize the music recording industry in less than a decade: the compact disc.

Millions of people are learning more about computers and the Internet. On the Internet, you can search directories, data files, reports, catalogs, and other resources for information on any topic imaginable. One way to learn about the most up-to-date technologies is to use them. These students are part of an interactive video class, which is similar to a videoconference. A student from any location that has a video camera and monitor can "attend" and participate in class, wherever it is. They can ask questions, provide answers, and take notes as shown here.

Richard C. Webb (Rick) was appointed in 1994 by Governor James B. Hunt Jr. to serve on the North Carolina Information Highway Advisory Council. He currently is executive director at AdvantageWest in Asheville.

Photographs in this article are provided courtesy of MCNC, the Microcomputing Center of North Carolina, in Research Triangle Park.

Tar Heel Junior Historian Association

North Carolina Museum of History
Department of Cultural Resources
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